ELLS RIVER WATER QUALITY

DATA REPORT

Alberta
ENVIRONMENT

102-05839/

ELLS RIVER WATER QUALITY

DATA REPORT

Prepared by:

Roderick Hazewinkel, B.Sc.
Limnologist

Air and Water Branch
Science and Standards Division
Environmental Assurance

September 2001

Pub No. T/618
ISBN No. 0-7785-1891-4 (Printed Edition)
ISBN No. 0-7785-1920-1 (On-Line Edition)
Web Site: http://www.gov.ab.ca/env/

Any comments, questions, or suggestions regarding the content of this document may be directed to:

Science and Standards Division
Alberta Environment
4th Floor, Oxbridge Place
9820 – 106th Street
Edmonton, Alberta T5K 2J6
Phone: (780) 427-5883
Fax: (780) 422-4192

Additional copies of this document may be obtained by contacting:

Information Centre
Alberta Environment
Main Floor, Great West Life Building
9920 – 108th Street
Edmonton, Alberta T5K 2M4
Phone: (780) 944-0313
Fax: (780) 427-4407
Email: env.infocent@gov.ab.ca

ACKNOWLEDGEMENTS

I thank all technical and professional staff of Alberta Environment and Alberta Sustainable Resource Development who assisted in the sampling program. Bridgette Halbig (Air and Water Branch, AENV) prepared the site map and assisted in report preparation. Review comments on the draft report were provided by Leigh Noton and Dave Trew (Air and Water Branch).

TABLE OF CONTENTS

ACKNOWLEDGEMENTS i
LIST OF TABLES iii
LIST OF FIGURES iii

1.0 INTRODUCTION 1

2.0 METHODS – GENERAL 1

3.0 RESULTS 1
3.1 General 1
3.2 Dissolved Oxygen 6
3.3 Ions and General 6
3.4 Nutrients 9
3.5 Metals 10
3.6 Bacteria 10

4.0 LITERATURE CITED 11

APPENDIX 13

LIST OF TABLES

Table 1 Ells River water quality sampling sites 2
Table 2 Water quality variables, Ells River February 2000 – April 2001 4

LIST OF FIGURES

Figure 1 Water quality sampling sites on the Ells River 3
Figure 2 Dissolved oxygen, upper Ells River, December 2000 – April 2001 7
Figure 3 Specific conductivity, upper Ells River, December 2000 – April 2001 8
Figure 4 pH, upper Ells River, December 2000 – April 2001 8

1.0 INTRODUCTION

The Alberta Fish and Wildlife Service (FWS, Alberta Sustainable Resource Development), with assistance from ALPAC, has been conducting a long-term fisheries monitoring program in the Ells River (Figure 1). To aid in the interpretation of the fisheries data, Alberta Environment (AENV) was asked by FWS to collect water quality data from the Ells River in an area of interest downstream of Gardiner Lake, over a one-year period (February 2000 through April 2001). As part of the survey, AENV also sampled water quality in the lower Ells River, at the Ft. MacKay water intake, to gather data near that point of use. These data, along with data collected on the Ells River prior to 2000, are compiled and presented in this report.

2.0 METHODS – GENERAL

The Ells River was surveyed at two sites (AB07DA3000 and AB07DA3005, Table 1, Figure 1) during February 2000 through April 2001. Standard physico-chemical parameters (water temperature, dissolved oxygen, pH, and specific conductivity) were recorded at the site, and water samples were collected for laboratory analysis of conventional water quality parameters and coliform bacteria (faecal coliforms and *Escherichia coli*). Most laboratory analyses were carried out at the Alberta Research Council (Vegreville). Exceptions were coliform bacteria, analysed at the Provincial Lab (Edmonton), and dissolved oxygen, analysed by the modified Winkler method at the AENV McIntyre Centre field facility (Edmonton). Details on the methods of sample collection and analysis are available from the Water Quality Section, Alberta Environment.

In addition to the sampling that occurred during February 2000 through April 2001, a data logger (Datasonde *in situ* recording meter, Hydrolab Corp.) was installed at the upstream site (AB07DA3000) during December 2000 through April 2001. Water temperature, dissolved oxygen, pH, and specific conductivity were recorded at intervals of one hour throughout this period. The logger was checked and re-calibrated monthly.

The pre-2000 data were collected mainly by the Athabasca Oil Sands Environmental Research Program (AOSERP), and some have been compiled and reported previously (i.e., Corkum 1985). Additional data were collected during other programs of AENV or Environment Canada, some of which have also been reported previously (e.g., Noton and Saffran 1995).

3.0 RESULTS

3.1 General

Water quality variables collected during the 2000 – 2001 sampling period are presented in Table 2. The table is organized such that field-measured and physical parameters are listed first, followed by major ions, nutrients, metals, carbon compounds, and biological parameters. A valid method variable code (VMV) is given for each parameter, indicating parameter type, analytical method, measurement units, and detection limit. For some parameters, a change in

Table 1. Ells River water quality sampling sites.

Station Code	Station Name	Station Description	Station Location		Period of Record	No. Samples
			Latitude	Longitude		
AB07DA3000	Ells River Near Namur Lake	Ells River South-East of Namur Lake near unnamed tributary	57°21'52"	112°34'40"	02/00 - 04/01	8
AB07DA3005	Ells River at Fort McKay Pumphouse	Ells River at town of Fort McKay water pumphouse station	57°13'56"	111°44'37"	02/00 - 02/01	8
AB07DA0750	Ells River	Ells River at the mouth: ARC km 223.2	57°18'16"	111°40'33"	07/72 - 03/96	36
AB07DA1240	Ells River near the Mouth no. 1 AOSERP	Ells River near the mouth no. 1 AOSERP	57°18'23"	111°40'20"	02/76 - 04/79	14
AB07DA1250	Ells River near the Mouth no. 2 AOSERP	Ells River near the mouth no. 2 AOSERP	57°18'12"	111°40'43"	08/76	1
AB07DA1260	Upper Ells River	Upper Ells River 5 miles below Gardiner Lakes at WSC gauge AOSERP	57°22'30"	112°33'40"	10/76 - 02/79	18
AB07DA1400	Lower Ells River	Lower Ells River 2 miles above confluence with Joslyn Creek at WSC gauge AOSERP	57°16'04"	111°42'51"	10/76 - 05/78	19

VMV occurred during the study. Where several VMVs apply to similar parameters, the parameters are grouped together in separate columns (this applies to Table 2 and Appendix A). A description of the VMV codes is available from Alberta Environment or from the Environment Canada ENVIRODAT code dictionary at http://www.cmc.ec.gc.ca/climate/envirodat.htm.

In addition to the 2000-01 data, historic (pre-2000) water quality data collected under AOSERP and other government surveys are compiled in Appendix A. These data are included to provide a complete set of the water quality data available for the Ells River in the AENV database. No attempt was made to screen the older data, some of which may have been produced by methods that would not meet present quality control practices. For example, data from the early 1970's may be questionable for some variables. Users are advised to apply scientific judgement when using such data.

Data from the Datasonde loggers, collected during December 2000 through April 2001 are presented in Figures 2 to 4. Water temperature throughout the December 2000 – April 2001 period remained a constant –0.2°C ±0.01°C, and is therefore not presented in a figure. Where

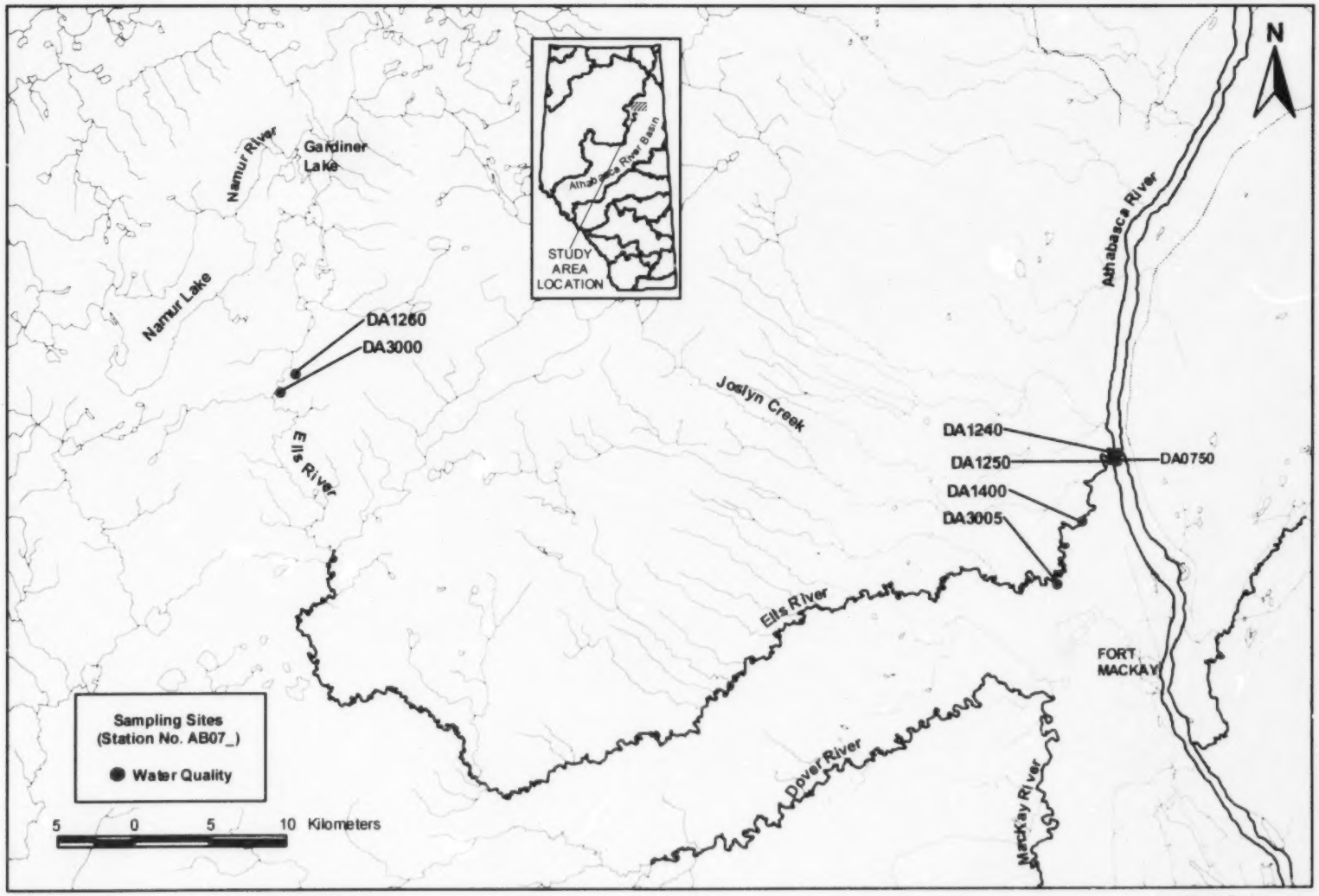

Figure 1. Water quality sampling sites on the Ells River.

Table 2 Water quality variables, Ells River, February 2000 - April 2001

Sample No	Date	Time	VMV Code Units	Water Temp 100925 °C	Dissolved Oxygen, Meter, Field 100922 mg/L	Dissolved Oxygen Winkler, Lab 8101 mg/L	pH, Field 100923 pH Units	pH, Lab 10301 pH Units	True Colour 2024 TCU	Turbidity 2074 NTU	Total Residue 10471 mg/L	NFR 10401 mg/L	TDS 207 mg/L	TDS, calc'd 100536 mg/L	PP Alkalinity 10151 mg/L	Total Alkalinity 10101 mg/L	Total CaCO3 Hardness 10602 mg/L	Specific Cond Field 100924 µS/cm	Specific Cond Lab 2041 µS/cm	Sum of Anions 125 MEQ/L	Sum of Cations 120 MEQ/L	Bicarbonate 6201 mg/L
ELLS RIVER NEAR NAMUR LAKE - AB07DA3000																						
00SWE00334	23-Feb-00	9 30		0 02	5 49		7 08					1 1						186				
00SWE01635	08-Jun-00	11 20		9 3	9 35	9 37	7 51	7 72	45		108	1	105	75 1	1 1	64	68	130	139	1 47	1 55	78
00SWE03083	23-Aug-00	9 30		15 49	9 24	9 01	7 57	7 91	60		130	3	128	73	1 1	63	66	127 9	126	1 43	1 5	77
00SWE03698	18-Oct-00	14 20		3 29	12 8	13 35	7 86	7 95	45		114	1	113	72 9	1 1	59	61	122 2	119	1 43	1 41	72
00SWE03964	13-Dec-00	10 30		-0 17	8 17	8 1	6 6											150 7				
01SWE00078	10-Jan-01	11 40		-0 07	7 86	7 18	7 77											148 7				
01SWE00145	22-Feb-01	12 15		-0 19	7 22	7 24	6 89	7 79	35		124	1	123	81 9	1 1	68	71	117	162	1 57	1 66	83
01SWE00537	11-Apr-01	9 30		-0 23	8 98		7 08											127 7				
ELLS RIVER AT PORT MCKAY PUMPHOUSE - AB07DA3005																						
00SWE00335	23-Feb-00	10 30		0 07	10 22		7 31					11						346				
00SWE01636	08-Jun-00	10 05		11 1	10		7 87	7 78	55		334	172	162	94 4	1 1	70	83	153	162	1 78	1 94	86
00SWE03082	23-Aug-00	8 15		16 67	9 04		7 74	8 05	70		170	11	159	99 1	1 1	81	82	168 5	182	1 93	1 96	98
00SWE03695	18-Oct-00	13 10		2 12	13 4		7 77	8 05	40		146	5	141	98 3	1 1	77	80	164 9	160	1 9	1 96	93
01SWE00144	22-Feb-01	13 30		-0 19	9 71	9 97	7 1	7 94	35		174	2	172	128	1 1	99	96	210	244	2 44	2 46	120
Water Quality Guidelines					ASWQG 5 mg/L (minimum, 1-day) 6 5 mg/L (minimum, 7-day mean)		ASWQG background ± 0 5 range 6 5 - 8 5		ASWQG blgnd + 10	CEQG blgnd, Q dependent		CEQG blgnd, Q dependent	CEQG-AGR(live) 500-3500 mg/L										

Sample No	Date	Time	VMV Code Units	Calcium, extr 101838 mg/L	Calcium, tot rec 101894 mg/L	Chloride, diss 102087 mg/L	Fluoride, diss 9107 mg/L	Magnesium, extr 101847 mg/L	Sodium, diss 102085 mg/L	Potassium, diss 102086 mg/L	Sulphate, diss 16306 mg/L	Sulphide, diss 101484 mg/L	Nitrite, diss 7205 mg/L	Nitrate & Nitrite, diss 7105 mg/L	TKN 7021 mg/L	Nitrogen, tot (TKN + NO_2/NO_3) calc'd mg/L	Ammonia, diss 7562 mg/L	TDP 103464 mg/L	TDP 15105 mg/L	Particulate Phosphorus 15901 mg/L	TP 15421 mg/L	Silica, reactive 102616 mg/L
ELLS RIVER NEAR NAMUR LAKE - AB07DA3000																						
00SWE00334	23-Feb-00	9 30			25 8							L0 001					0 028					
00SWE01635	08-Jun-00	11 20		18 1	17 3	1 8	0 09	5 4	4	1	6	L0 001	L0 001	0 013	0 6	0 613	0 007		0 014	0 024	0 038	4 8
00SWE03083	23-Aug-00	9 30		17 9	18 6	1 1	0 1	5 06	3 9	0 9	6	0 003	0 004	0 019	0 72	0 739	0 012	0 024		0 023	0 047	5
00SWE03698	18-Oct-00	14 20		16 3	16 8	0 9	0 11	4 79	4	0 8	10	0 002	0 005	0 122	0 64	0 762	0 054	0 011		0 012	0 023	4 5
00SWE03964	13-Dec-00	10 30																				
01SWE00078	10-Jan-01	11 40																				
01SWE00145	22-Feb-01	12 15		19 7	19 6	0 5	0 11	5 23	4 9	1 3	8	L0 001	0 002	0 229	0 53	0 759	0 026	0 029		0 013	0 042	6 3
01SWE00537	11-Apr-01	9 30																				
ELLS RIVER AT PORT MCKAY PUMPHOUSE - AB07DA3005																						
00SWE00335	23-Feb-00	10 30										L0 001					0 036					
00SWE01636	08-Jun-00	10 05		22 1	20 9	4 3	0 1	6 78	5 9	1 1	12		L0 001	L0 005	0 83	0 83	0 007		0 013	0 187	0 2	4 5
00SWE03082	23-Aug-00	8 15		22 6	23 1	2 3	0 11	6 26	6 7	1	12		0 001	L0 005	0 75	0 75	0 007	0 016		0 037	0 053	2 5
00SWE03695	18-Oct-00	13 10		21 8	21 6	1 5	0 37	6 16	7 2	1	14		0 004	0 06	0 58	0 64	0 007	0 01		0 014	0 024	3 1
01SWE00144	22-Feb-01	13 30		27 3	27 1	1 4	0 13	6 75	11 7	1 4	19		0 003	0 294	0 53	0 824	0 015	0 018		0 014	0 032	7
L = Less than					CEQG-AGR(live) 1000 mg/L	CEQG-AGR(irr) 100-700 mg/L						CEQG-AGR(live) 1000 mg/L	USEPA 0 002 mg/L	CEQG 0 06 mg/L			ASWQG 1 0 mg/L	CEQG pH, Temp dependent				ASWQG 0 05 mg/L	

Shaded values indicate guideline exceedence
Guidelines for the protection of aquatic life, unless noted

ASWQG = Alberta Surface Water Quality Guideline
CEQG = Canadian Environmental Quality Guideline
AGR(irr) = irrigation water
AGR(live) = livestock water
REC = recreation and aesthetics
USEPA = United States Environmental Protection Agency

Table 2. Water quality variables, Ells River, February 2000 - April 2001. (continued)

Sample No	Date	Time		Aluminum, tot rec	Antimony, tot rec	Arsenic, tot rec	Barium, tot rec	Beryllium, tot rec	Bismuth, tot rec	Boron, tot rec	Cadmium, tot rec	Chromium, tot rec	Chromium,	Cobalt, tot rec	Copper, tot rec	Iron, extr	Iron, diss	Iron, tot rec	Lead, tot rec	Lithium, tot rec	Manganese, diss	Manganese, tot rec
			VMV Code	101888	101914	101889	101891	101892	101893	101890	101895	101926	101898	101937	101899	102082	101827	101936	101912	101902	101792	101904
			Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
ELLS RIVER NEAR NAMUR LAKE - AB07DA3000																						
00SWE00334	23-Feb-00	9 30		37	0 052	0 68	43 7	0 04	L0 005	35 2	L0 02		0 11	0 101	0 42		79	255	0 056	11 7	21 3	30
00SWE01635	08-Jun-00	11 20		56	0 049	0 7	31 6	L0 04	0 008	21 9	L0 02		0 22	0 13	0 48	170		246	0 056	7 8		36 7
00SWE03083	23-Aug-00	9 30		20 4	0 052	0 93	31 1	L0 04	L0 005	25 1	L0 02		L0 1	0 094	0 36	283		323	L0 01	6 56		35 7
00SWE03698	18-Oct-00	14 20		28 8	0 073	0 78	27 5	0 081	0 01	22 4	L0 02		L0 1	0 11	0 47	176		183	0 04	8 4		17 9
00SWE03964	13-Dec-00	10 30																				
01SWE00078	10-Jan-01	11 40																				
01SWE00145	22-Feb-01	12 15		59 4	0 047	0 71	33 5	0 09	0 018	24 3	L0 02	0 26		0 099	L0 08	259		274	L0 01	10		22
01SWE00537	11-Apr-01	9 30																				
ELLS RIVER AT FORT MCKAY PUMPHOUSE - AB07DA3005																						
00SWE00335	23-Feb-00	10 30															40				12 3	
00SWE01636	08-Jun-00	10 05		4799	0 094	2 71	80 8	0 21	0 037	42 6	0 055		6	2 14	4 4	1750		5912	2 74	14 6		163
00SWE03082	23-Aug-00	8 15		424	0 065	1 05	34 2	0 064	0 009	41	L0 02		0 46	0 26	0 8	457		797	0 126	9 5		44 8
00SWE03695	18-Oct-00	13 10		163	0 044	0 64	28 4	0 1	L0 005	35 4	L0 02		0 5	0 15	0 56	522		566	0 102	10 2		14 2
01SWE00144	22-Feb-01	13 30		267	0 075	0 6	38 6	0 1	0 028	48	0 09	0 54		0 13	L0 08	371		419	0 17	13 3		11 8
Water Quality Guidelines				CEQG pH, $[Ca^{2+}]$, DOC dependent (100 µg/L at sample pH/$[Ca^{2+}]$/[DOC])		CEQG 5 µg/L		CEQG-AGR 100 µg/L			CEQG $[CaCO_3]$ dependent (0 018 µg/L at sample $[CaCO_3]$)	CEQG 8 9 µg/L		CEQG-AGR(irr) 50 µg/L	ASWQG $[CaCO_3]$ dependent (8 1 µg/L at sample $[CaCO_3]$)		CEQG 300 µg/L		CEQG $[CaCO_3]$ dependent (2 0 µg/L at sample $[CaCO_3]$)		

Sample No	Date	Time		Mercury, tot	Molybdenum, tot rec	Nickel, tot rec	Selenium, tot rec	Selenium, tot rec	Silver, tot rec	Strontium, tot rec	Strontium, tot rec	Thallium, tot rec	Thorium, tot rec	Tin, tot rec	Titanium, tot rec	Uranium, tot rec	Vanadium, tot rec	Zinc, tot rec	DOC	Faecal Coliforms	Escherichia coli
			VMV Code	101980	101905	101938	101930	101915	101887	101918	101931	101921	101919	101917	101920	101922	101923	101924	6107	36012	100632
			Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	No /100 mL	No /100 mL
ELLS RIVER NEAR NAMUR LAKE - AB07DA3000																						
00SWE00334	23-Feb-00	9 30			0 72	0 34		1 0 4	L0 005		101	0 0031	0 006	L0 1	1 4	0 104	0 22	3 69	12 2			
00SWE01635	08-Jun-00	11 20		L0 005	0 62	0 6	L0 5		0 006		70 7	L0 003	0 017	L0 1	1 9	0 073	0 39	1 21	12 7			
00SWE03083	23-Aug-00	9 30		0 013	0 56	0 68	L0 5		L0 005		72	L0 003	0 007	L0 1	0 7	0 049	0 243	0 97	14 3			
00SWE03698	18-Oct-00	14 20		L0 005	0 6	0 62	L0 5		L0 005		66 2	L0 003	0 044	L0 1	1 2	0 062	0 22	4 7	13			
00SWE03964	13-Dec-00	10 30																				
01SWE00078	10-Jan-01	11 40																				
01SWE00145	22-Feb-01	12 15		L0 005	0 54	0 86	L0 5		L0 005		78 6	L0 003	0 032	L0 1	2	0 062	0 348	1 55	13 7			
01SWE00537	11-Apr-01	9 30																				
ELLS RIVER AT FORT MCKAY PUMPHOUSE - AB07DA3005																						
00SWE00335	23-Feb-00	10 30																	13 5	10	L10	
00SWE01636	08-Jun-00	10 05		L0 005	0 41	5 8	L0 5		0 026	98 5		0 044	1 02	L0 1	68	0 63	11 7	14 2	13 8	10	10	
00SWE03082	23-Aug-00	8 15		0 02	0 62	1 2	L0 5		L0 005		100	L0 003	0 038	L0 1	6 4	0 111	1 04	2 01	15 9	10	10	
00SWE03695	18-Oct-00	13 10		L0 005	0 52	0 85	L0 5		L0 005		91 1	0 005	0 027	L0 1	8	0 086	0 58	0 77	14 3	20	L10	
01SWE00144	22-Feb-01	13 30		L0 005	0 57	1 16	L0 5		L0 005		110	0 009	0 087	L0 1	5 9	0 123	0 76	3 03	14 2	10	10	

L = Less than			ASWQG	CEQG	CEQG		CEQG	CEQG									CEQG-AGR	CEQG		CEQG-REC	CEQG-REC	
Shaded values indicate guideline exceedence			0 005 µg/L	73 µg/L	$[CaCO_3]$		1 µg/L	0 1 µg/L									100 µg/L	30 µg/L		geo Mean<200/100mL	geo Mean	
Guidelines for the protection of aquatic life, unless noted					dependent (65 µg/L at sample $[CaCO_3]$)															CEQG-AGR(Live) geo Mean<100/100mL	<200/100mL	

ASWQG = Alberta Surface Water Quality Guideline
CEQG = Canadian Environmental Quality Guideline
AGR(irr) = irrigation water
AGR(live) = livestock water
REC = recreation and aesthetics
USEPA = United States Environmental Protection Agency

measurements were taken for the purpose of instrument calibration, these are included in the figures. Equilibrium solubility for dissolved oxygen, determined by the method of Benson and Krause (1980), is shown in Figure 2. Values for atmospheric pressure used in the solubility model were approximated from the elevation of sampling sites, which was determined from 1:100,000 scale NTS maps.

All data presented in this report are stored in the AENV water data system (WDS) and are available in an electronic format.

Guideline values for the protection of aquatic life are also given in Table 2, the exceedence of which is indicated by the shading of cells. The values shown are the most stringent of guidelines established by AENV, the Canadian Council of Ministers of the Environment (CCME), and the United States Environmental Protection Agency (USEPA) (AE 1999 http://www.gov.ab.ca/env/water/Reports/; CCME 1999; USEPA 1999 http://www.epa.gov/waterscience/pc/revcom.pdf). Guidelines shown are for the protection of aquatic life, except where indicated. Natural conditions may be such that guidelines are exceeded regardless of human influence. For this reason, parameters with values that approach guideline levels are briefly discussed below.

3.2 Dissolved Oxygen

Dissolved oxygen levels (DO) were above guideline levels in all grab samples collected from the two sites on the Ells River in 2000-01 (Table 2). Summer dissolved oxygen levels tended to be higher than winter levels, probably due to ice cover (typically from late October to mid-April) impeding atmospheric gas exchange. Winter dissolved oxygen levels also tended to be lower at the upstream site than at the downstream site, possibly because open water leads in the high gradient reach between the sites permitted re-aeration. During summer, there was little difference in DO concentrations between the two sites, indicating that photosynthetic oxygen production did not differ substantially from upstream to downstream.

Winter dissolved oxygen data collected on a continuous basis at the upstream site (Figure 2) show that under-ice dissolved oxygen levels, while well below saturation levels, remained above guidelines throughout the sampling period (December 2000 - April 2001). Slight diurnal fluctuations (<0.5 mg·L^{-1}day^{-1}) during mid-February and in early April indicate that under-ice photosynthesis may have been occurring then.

3.3 Ions and General

Changes in major ion concentrations can collectively be approximated by changes in specific conductivity, total dissolved solids (TDS), the sum of anions and cations, and to some extent by changes in hardness. There is a general increase in these parameters in the December, January,

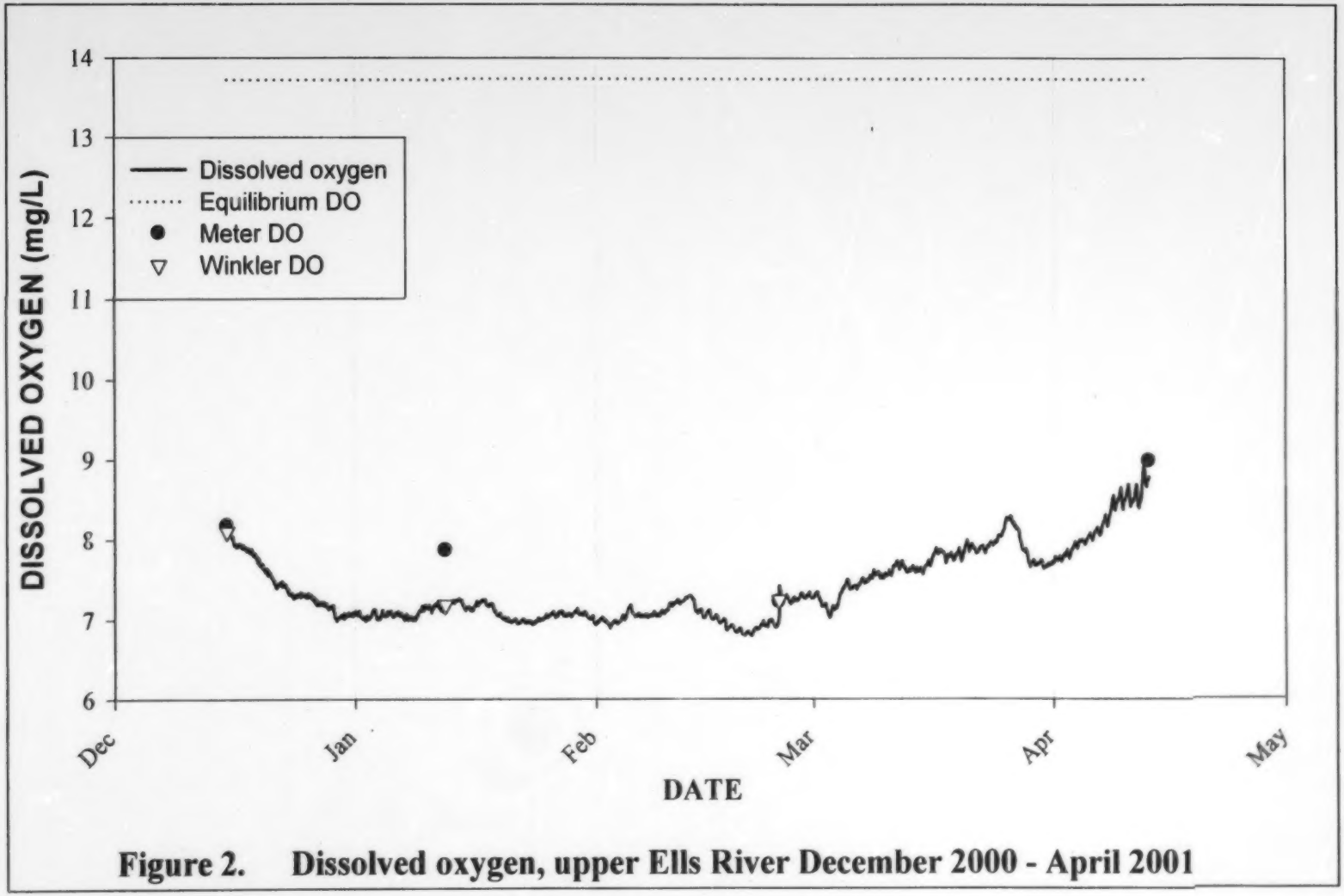

Figure 2. Dissolved oxygen, upper Ells River December 2000 - April 2001

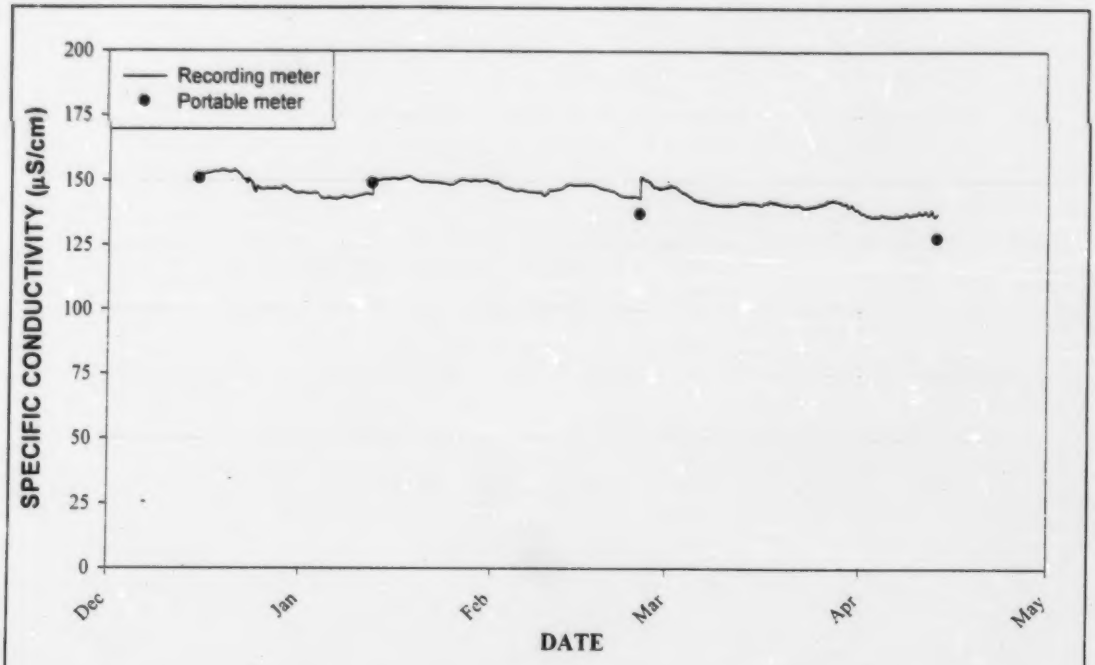

Figure 3. Specific conductivity, upper Ells River December 2000 - April 2001

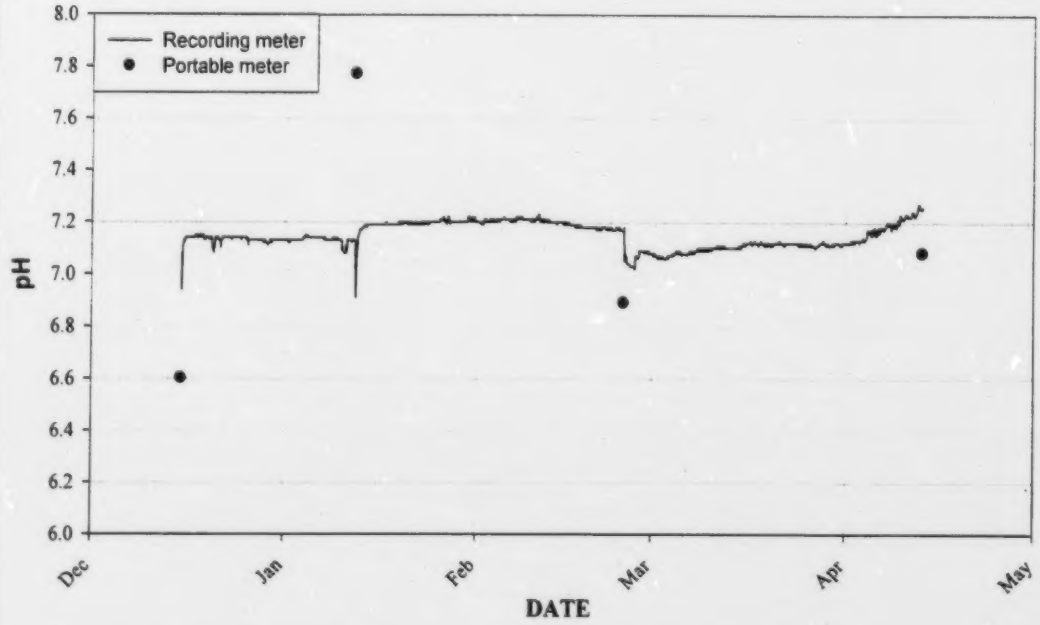

Figure 4. pH, upper Ells River December 2000 - April 2001

and February samples, consistent with a relative increase in the proportion of groundwater infiltration to total discharge during the winter. This trend appears also to be borne out in the continuous monitoring data for specific conductivity, in which conductivity appears to decrease gradually beginning in March, 2000, probably reflecting meltwater inflow (Figure 3). The only major ion that does not appear to follow this pattern is the chloride ion, which occurs at greater concentrations during the summer. Concentrations of all major ions are higher at the downstream site.

Dissolved sulphide exceeded the USEPA guideline level of 2 $\mu g \cdot L^{-1}$ in August 2000, and was at the guideline level in October 2000. However, guideline levels for sulphide are very near the limit of detection, and further sampling would be required to confirm the existence and extent of guideline exceedence. As well, because of the safety factor built into water quality guidelines and the ability of some species to adapt to local natural conditions, these slight, probably natural exceedences do not necessarily imply adverse effects on aquatic biota.

Total and non-filterable residues (i.e., suspended solids) were high in the June 2000 sample (and to a lesser extent in the August 2000 sample) at the downstream site, when flows were higher than in other seasons. Suspended solids are probably lower at the upstream site because of its lake origin. The Ells River then flows through a high gradient reach as it leaves the Birch Mountains, where bank and bed erosion may contribute suspended material (Corkum 1985).

3.4 Nutrients

Phosphorus and nitrogen are generally considered to be the limiting nutrients in most lakes and rivers. The ASWQ guideline for total phosphorus is 0.05 $mg \cdot L^{-1}$. This value is exceeded in the June and August 2000 samples at the downstream site, when phosphorus concentrations are 0.2 $mg \cdot L^{-1}$ and 0.053 $mg \cdot L^{-1}$, respectively. These exceedences occur as a result of elevated levels of particulate phosphorus in both samples, which are in turn associated with a general increase in particulate matter entrained in rainfall runoff. The ASWQ guideline for total nitrogen is 1.0 $mg \cdot L^{-1}$, and for nitrite is 0.06 $mg \cdot L^{-1}$. These values are not exceeded in any of the samples. The ASWQ guidelines also stipulate that nitrate concentrations that stimulate the growth of aquatic plants should be avoided, however this guideline cannot be evaluated given the scope of the present study. Levels of nitrate and nitrite are highest in the October and February samples (nutrient levels were not evaluated in the December and January samples). This is probably due to reduced nitrogen assimilation by algae during these months, as total nitrogen concentrations do not show any appreciable seasonal variability, indicating that nitrogen inputs also do not vary appreciably.

Although ammonia is not considered a nutrient, it is examined here along with other nitrogen-containing compounds. Ammonia levels are all well below the CEQ guideline levels in all samples. Ammonia concentrations also show a similar pattern of seasonal variation to that of nitrate and nitrite, probably as a result of the de-nitrification of organic nitrogen compounds. These three forms of nitrogen, all in different states of oxidation, appear to be drawn from a pool of organic nitrogen, as indicated by seasonal variations in total Kjeldahl nitrogen (TKN; includes ammonia and organic nitrogen). In contrast to ammonia and nitrate/nitrite nitrogen, Kjeldahl

nitrogen appears to decrease in the winter and increase in the summer. This is consistent with an increase in algal nitrogen assimilation in the summer.

3.5 Metals

Metals and other poorly soluble elements are often associated with particulate matter as colloids, complexed with organic or inorganic matter, or suspended in insoluble forms. For this reason, an unfiltered sample may contain higher than normal levels of metals when large amounts of particulate matter are present in the sample, for example following a large rainstorm. The amount of particulate matter entrained by the river is affected by bank and bed erosion, overland flow, land use in contributing basins, and by activities that take place directly in tributaries or in the river itself.

Aluminum concentrations are elevated above CEQ guideline levels of 0.1 $mg \cdot L^{-1}$ in all samples at the downstream site. The sample taken in June of 2000 has the highest concentrations of aluminum, indicating that the elevated levels are probably associated with particulate or organic matter entrained in the higher flows of that period. The same is probably true of the levels of iron that occur in all of the downstream samples, and in the August 2000 upstream sample. These five samples also contain the highest concentrations of dissolved organic carbon (DOC). Lead exceeds guideline levels at the downstream site in June of 2000, again possibly as a result of relatively high levels of particulate matter in the samples. Cadmium exceeded guideline levels in June 2000 and February 2001, although the concentrations encountered in these samples (0.055 $\mu g \cdot L^{-1}$ and 0.09 $\mu g \cdot L^{-1}$, respectively) are near the analytical detection limit and thus have reduced accuracy. Mercury levels were also slightly above guideline levels at both sites in August 2000 (0.013 $\mu g \cdot L^{-1}$ upstream, 0.020 $\mu g \cdot L^{-1}$ downstream).

3.6 Bacteria

Coliform bacteria (faecal coliforms, *Escherichia coli*) were sampled at the downstream site, adjacent to the Ft. MacKay water intake. Although both bacterial groups were detected in some samples (Table 2), the counts were well below guidelines for recreational use in all samples. These bacteria can be detected at similar low levels in many natural surface waters in Alberta.

4.0 LITERATURE CITED

Alberta Environment. 1999. Surface Water Quality Guidelines for use in Alberta. Environmental Service, Environmental Sciences Division/Natural Resources Service, Water Management Division. 20 pp

Benson, B.B., and D. Jr. Krause. 1980. The Concentration and Isotopic Fractionation of Gases Dissolved in Freshwater in Equilibrium with the Atmosphere. 1. Oxygen. Limnology and Oceanography 25(4) pp. 662-671.

Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Council of Ministers of the Environment, Winnipeg, MB.

Corkum, L.D. 1985. Water Quality of the Athabasca Oil Sands Area: A Regional Study. Research Management Division, Alberta Environment. 172 pp. + App.

Noton, L.R., and K.A. Saffran. 1995. Water Quality in the Athabasca River System. Technical Services and Monitoring Division, Alberta Environmental Protection. 102 pp. + App.

United States Environmental Protection Agency. 1999. National Recommended Water Quality Criteria – Correction. United States Environmental Protection Agency, Washington, DC.

APPENDIX

Appendix Water quality data, Ells River 1972 - 1996.

Sample No.	Date	Time	Sampling Depth	Sampling distance fr. L bank	Sampling distance fr. R bank	Water Temp	Water Temp	Dissolved Oxygen, Meter, Field	Dissolved Oxygen Winkler, Lab.	Dissolved Oxygen, Meter, Field	COD	COD	BOD	pH, Field	pH, Lab.	Redox Potential
VMV Code:			97251	97202	97206	100925	2061	100922	8101	8102	8301	8304	8202	100923	10301	2031
Units:			m	m	m	°C	°C	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	pH Units	pH Units	mV
ELLS RIVER NEAR THE MOUTH - AB07DA0750																
72AB000038	31-Jul-72	12:00													8.3	
72AB000039	22-Aug-72	12:00													8.3	
72AB000040	25-Sep-72	12:00													8	
72AB000041	28-Sep-72	12:00													7.6	
72AB000042	5-Oct-72	12:00													8.1	
73AB000054	17-Jun-73	18:20									52				6	
73AB000055	14-Aug-73	16:15									53.6				8.2	
74AB000038	19-Aug-74	13:15					14				39				7.9	
75AB000028	2-Jul-75	13:30					16				196				7.8	
89AB000472	7-Feb-89	12:00														
89AB000473	14-Feb-89	12:15					-0.1		12.96	13.2		41	0.9	7		
89AB000474	14-Feb-89	12:20							12.94							
89AB000475	7-Mar-89	12:00														
89AB000476	9-Mar-89	10:45					0		12.39	12.5		38	0.6	7.5	7.92	
89AB000477	9-Mar-89	10:50							12.34							
90AB000193	14-Mar-90	12:00														
90AB000194	15-Mar-90	9:00					-0.1		10.9	11.1			0.6	7.5	7.61	
91AB000277	7-Mar-91	11:00					-0.08		8.31	8.77			1.2	7.15	7.54	
91AB006612	7-Mar-91	11:00														
91AB000278	7-Mar-91	11:05							8.34							
92AB000239	26-Feb-92	10:30					-0.2		12.57	12.9			0.3	8	7.6	
92AB008072	26-Feb-92	10:30														
92AB000240	26-Feb-92	10:35							12.7							
92AB000241	27-Feb-92	12:00														
93AB000237	10-Mar-93	12:00														
93AB000238	11-Mar-93	9:00					0.19		9.73	9.45			0.2	7.19	7.49	
93AB007759	11-Mar-93	9:00														
93AB000239	11-Mar-93	9:05							9.8							
94AB000285	10-Mar-94	11:30					0.04		12.36	12.78		31	0.4	7.12	7.5	
94AB007040	10-Mar-94	11:30														
94AB000286	10-Mar-94	11:35							12.3							
94AB000287	10-Mar-94	12:00														
95AB002121	10-Mar-95	10:45					0.04		8.46	8.9		41	0.2	6.95	7.76	
95AB004561	10-Mar-95	10:45														
96AB000660	8-Mar-96	10:50				-0.04		9.78	10.15		34		0.3	7.53	7.19	
96AB001630	8-Mar-96	10:50														
ELLS RIVER NEAR THE MOUTH - AB07DA1240																
76AB004090	11-Feb-76	15:26					0							6.6	7.5	
76AB004091	13-May-76	10:46												7.6	7.7	
78AB005744	5-Jun-78	9:10	0.5		1		18	7.2			150			8	7.65	
78AB005745	13-Jul-78	10:20	0.3	7	2		17.5	9.8			47				7.85	
78AB005746	15-Aug-78	8:50	0.1	7	3		15	9.2			126			8.5	7.7	
78AB005747	7-Sep-78	9:40	0.2	10	3		13	9.3			80			8.1	8.05	
78AB005748	17-Oct-78	9:10	0.3	12	2		5.4	8.7			195			8.6	7.35	
78AB005749	20-Nov-78	9:20	0.3	12	4		0	13.4			57			7.5	7.5	
78AB005750	18-Dec-78	10:00	1	15	7						28			7.6	7.3	
79AB003558	3-Jan-79	8:50	0.3	7	7						39			7.1	7.5	
79AB003559	5-Feb-79	11:15	1	8	9						23				8	
79AB003560	5-Feb-79	11:45														
79AB003561	20-Mar-79	9:15	1	7	7						32				7.7	
79AB003562	17-Apr-79	9:30	1	7	7		0				42				7.9	

Appendix Water quality data, Ells River 1972 - 1996.

Sample No.	Date	Time		Sampling Depth	Sampling distance fr. L bank	Sampling distance fr. R bank	Water Temp	Water Temp	Dissolved Oxygen, Meter, Field	Dissolved Oxygen Winkler, Lab.	Dissolved Oxygen, Meter, Field	COD	COD	BOD	pH, Field	pH, Lab.	Redox Potential
			VMV Code:	97251	97202	97206	100925	2061	100922	8101	8102	8301	8304	8202	100923	10301	2031
			Units:	m	m	m	°C	°C	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	pH Units	pH Units	mV
ELLS RIVER NEAR THE MOUTH - AB07DA1250																	
76AB004092	12-Aug-76	12:10										100				6.8	
UPPER ELLS RIVER - AB07DA1260																	
76AB004093	8-Oct-76	9:35										39.8				7.3	
76AB004094	9-Nov-76	9:50						0				38				7.1	
77AB003730	4-Jan-77	14:15						0				39				7.2	
77AB003731	7-Feb-77	14:10						0				47				7.1	
77AB003732	1-Mar-77	12:10						0				30				7.2	
77AB003733	1-Mar-77	15:50															
77AB003734	5-May-77	12:00		0.15	1.7			11				43				7.4	
77AB003735	31-May-77	14:55		0.15				17.5	2			42				7.2	
77AB003736	24-Jun-77	14:45		0.15				17.5	6.4			36				8.1	
77AB003737	26-Jul-77	13:00		0.15		1.3		13				35				7.4	
77AB003738	23-Aug-77	11:50		0.15	2			13				36				7.2	
77AB003739	21-Sep-77	12:45		0.15	1.67			11				24				7.61	
77AB003740	18-Oct-77	11:30		0.15	1			3				54				7.46	
77AB003741	3-Dec-77	12:00				2		0				20				7.45	
78AB005751	11-Jan-78	13:30				10		1				37				7.37	
78AB005752	8-Feb-78	14:00										19			7.9	7.25	
78AB005753	28-Feb-78	12:20				6.66		0				44				7.15	
78AB005754	10-Apr-78	16:35				12		1	8.2			10				6.88	
78AB005755	2-May-78	14:30										40				7.32	
78AB005756	27-Jun-78	12:10						16				73				7.72	
78AB005757	25-Jul-78	12:00		0	1			17				57				7.4	
78AB005758	22-Aug-78	10:45		0.2	15	2		15				94				7.82	
78AB005759	19-Sep-78	15:30						9				25				7.38	
78AB005760	19-Oct-78	13:25		0	0			7				105				7.32	
78AB005761	1-Dec-78	15:10			3							61				7.1	
78AB005762	14-Dec-78	10:10			4							39				7.35	
79AB003563	12-Jan-79	13:45			10	10						42				7.25	
79AB003564	9-Feb-79	8:30			5							28				7.85	
LOWER ELLS RIVER - AB07DA1400																	
76AB004128	9-Oct-76	10:00										37				7.8	
76AB004129	10-Nov-76	9:05						0				39				7.3	
77AB003804	4-Jan-77	14:35						0				51				7.3	
77AB003805	9-Feb-77	14:50						0				41				7.4	
77AB003806	2-Mar-77	13:30										93				7.8	
77AB003807	1-Apr-77	14:45						0	13.4			19				8.3	
77AB003808	18-May-77	10:15				2.9		9.25	11.6			48			7.4	7.5	
77AB003809	20-Jun-77	9:55			1.3			19	2.6			108			8.3	8	
77AB003810	14-Jul-77	14:20		0.15				16.5	6.8			42			8.2	7.7	
77AB003811	15-Aug-77	11:50				1.67		14	8.7			17			8.2	7.75	
77AB003812	23-Aug-77	11:50															
77AB003813	13-Sep-77	10:55		0.15				12	10.6			30			8.1	7.81	
77AB003814	12-Oct-77	12:45		0.15				1.5	14.2			34				8.03	94
77AB003815	7-Nov-77	13:50				2		0.5				48			8	7.95	
77AB003816	7-Dec-77	13:30		0.15		5		0				20			8.2	7.36	
78AB005782	8-Feb-78	10:00						0				14			8.5	7.55	
78AB005783	20-Mar-78	11:36						0	10.8			30			7.6	7.65	
78AB005784	6-Apr-78	15:25				3		0	11			21			7.55	7.2	
78AB005785	3-May-78	11:45						6	14.4			69			7.7	7.35	

Note: L = Less than, G = Greater than

Appendix Water quality data, Ells River 1972 - 1996. (continued)

Date	Time	True Colour 2021 Rel. Units	True Colour 2024 TCU	Apparent Colour 2011 Rel. Units	Turbidity 2073 JTU	Turbidity 2074 NTU	Residue, tot. 10471 mg/L	Residue, Filterable 10451 mg/L	Residue, tot. Fixed 10571 mg/L	Residue, Fixed Filterable 10551 mg/L	NFR 10401 mg/L	NFR 10407 mg/L	NFR, Fixed 10501 mg/L	Residue, tot. Volatile 10521 mg/L	Total Alkalinity 10101 mg/L	Total Alkalinity 10111 mg/L	PP Alkalinity 10151 mg/L	Total CaCO3 Hardness 10603 mg/L
ELLS RIVER NEAR THE MOUTH - AB07DA0750																		
31-Jul-72	12:00				2.3													
22-Aug-72	12:00				2										88.1		0	90.5
25-Sep-72	12:00				4										101			
28-Sep-72	12:00				2										107		0	
5-Oct-72	12:00				3		260								67		0	
17-Jun-73	18:20				G15		890		766					124	138		0	
14-Aug-73	16:15				30		172		102		68			70				
19-Aug-74	13:15				3										64			
2-Jul-75	13:30														73		0	
7-Feb-89	12:00														76		0	
14-Feb-89	12:15		58			9						4						
14-Feb-89	12:20																	
7-Mar-89	12:00																	
9-Mar-89	10:45		51			7.9						4			114			
9-Mar-89	10:50																	
14-Mar-90	12:00																	
15-Mar-90	9:00		44			6.9	212				5				103			
7-Mar-91	11:00		70			4.7	366				4				204			
7-Mar-91	11:00																	
7-Mar-91	11:05																	
26-Feb-92	10:30		30			5.4	182				2				96			
26-Feb-92	10:30																	
26-Feb-92	10:35																	
27-Feb-92	12:00																	
10-Mar-93	12:00																	
11-Mar-93	9:00		45			5.1	174				2				97			
11-Mar-93	9:00																	
11-Mar-93	9:05																	
10-Mar-94	11:30		44			6.9	238				4				135			
10-Mar-94	11:30																	
10-Mar-94	11:35																	
10-Mar-94	12:00																	
10-Mar-95	10:45		39			4.5	258				2				157			
10-Mar-95	10:45																	
8-Mar-96	10:50	30				6	195				L0.4					124	L0.1	
8-Mar-96	10:50																	
ELLS RIVER NEAR THE MOUTH - AB07DA1240																		
11-Feb-76	15:26			20	4.9						12	11			85		0	
13-May-76	10:46			70	23			131		91	40	32			65.5		0	
5-Jun-78	9:10	50			22.5			76		60	47.6	38.4			63.2		L0.1	65
13-Jul-78	10:20	30			3.7			77		61	3.6	L0.4			65.1		L0.1	67
15-Aug-78	8:50	35			5.3			97		61	3.6	L0.4			80.8		L0.1	
7-Sep-78	9:40	90			23			131		93	29.6	22.4			105.1		L0.1	
17-Oct-78	9:10	80			17			82		50	25.6	19.2			62.9		L0.1	
20-Nov-78	9:20	80			7.4			125		90	3.2	0.4			91.4		L0.1	
18-Dec-78	10:00	30			5			118		81	16.4	9.2			83.2		L0.1	
3-Jan-79	8:50	30			6.5			126		93	7.2	L0.4			84		L0.1	
5-Feb-79	11:15	25			7.3			142		88	8.8	3.6			84.8		L0.1	
5-Feb-79	11:45																	
20-Mar-79	9:15	30			9.6			120		77	4.4	0.8			77.8		L0.1	
17-Apr-79	9:30	30			0.9			165		114	1.6	L0.4			90.2		L0.1	

Appendix Water quality data, Ells River 1972 - 1996. (continued)

Date	Time	True Colour 2021 Rel. Units	True Colour 2024 TCU	Apparent Colour 2011 Rel. Units	Turbidity 2073 JTU	Turbidity 2074 NTU	Residue, tot. 10471 mg/L	Residue, Filterable 10451 mg/L	Residue, tot. Fixed 10571 mg/L	Residue, Fixed Filterable 10551 mg/L	NFR 10401 mg/L	NFR 10407 mg/L	NFR, Fixed 10501 mg/L	Residue, tot. Volatile 10521 mg/L	Total Alkalinity 10101 mg/L	Total Alkalinity 10111 mg/L	PP Alkalinity 10151 mg/L	Total CaCO3 Hardness 10603 mg/L
ELLS RIVER NEAR THE MOUTH - AB07DA1250																		
12-Aug-76	12:10			40	31.5			119		116	23.2		12.4		78		0	85.8
UPPER ELLS RIVER - AB07DA1260																		
8-Oct-76	9:35			35				75		60	12.8		8.4		58.8		0	64.3
9-Nov-76	9:50			35				86		68	3.2		1.2		59.9		0	61.8
4-Jan-77	14:15			35	2.8			106		91	7.2		4.4		70.3		0	66.4
7-Feb-77	14:10			35	1.8			102		79	1.2		L0.4		67.2		0	70.1
1-Mar-77	12:10			5	2.4			99		78	4.4		2.4		69.6		0	72.6
1-Mar-77	15:50																	
5-May-77	12:00			25	1.3			72		47	6		2.4		48.8		0	47.7
31-May-77	14:55			40	4.4			68		46	6.8		0.8		52.2		0	51.4
24-Jun-77	14:45			25	2.4			72		43	4		2		53.7		0	54.7
26-Jul-77	13:00			30	3.5			59.6		37	4.8		0.8		49.6		0	54.7
23-Aug-77	11:50			20	1.3			69		51	2.8		L0.4		50		0	53.9
21-Sep-77	12:45			25	0.5			72		48	2.4		0.8		59.6		0	59.3
18-Oct-77	11:30			25	11.35			69.2		41	16.8		14		54		0	54.7
3-Dec-77	12:00			25	1.1			80.8		61	2		0.4		59.8		0	61.4
11-Jan-78	13:30			25	3.1			83		68	2		0.4		64.4		0	64.7
8-Feb-78	14:00			30	0.5			92.6		75	0.8		L0.4		64.4		0	69.6
28-Feb-78	12:20			25	0.5			92		78	1.6		L0.4		65.8		0	72.1
10-Apr-78	16:35			25	0.8			75		53	2		L0.4		49.6		0	56.1
2-May-78	14:30			80	5.95			46			12		6.8		37.8		0	39.4
27-Jun-78	12:10	45			1.9			66		49	2.4		L0.4		52.7		L0.1	53
25-Jul-78	12:00	35			2.1			58		41	1.2		L0.4		50.9		L0.1	51
22-Aug-78	10:45	30			3.4			69		47	3.6		L0.4		59.9		L0.1	
19-Sep-78	15:30	40			2.1			89		67	2.4		L0.4		48.4		L0.1	
19-Oct-78	13:25	30			3.2			59		39	4.8		4.4		50.1		L0.1	
1-Dec-78	15:10	40			40			75		50	86		56		57.1		L0.1	
14-Dec-78	10:10	80			3.1			264		173	3.6		L0.4		211.6		L0.1	
12-Jan-79	13:45	35			5.2			85		62	4		L0.4		56		L0.1	
9-Feb-79	8:30	30						82		56					59.4		L0.1	
LOWER ELLS RIVER - AB07DA1400																		
9-Oct-76	10:00			35				160		85	9.2		3.6		101		0	101.2
10-Nov-76	9:05			45				139		131	6.8		4.8		111.6		0	110.3
4-Jan-77	14:35			35	5			150		99	9.6		6		107		0	107.8
9-Feb-77	14:50			30	29			185		159	7.2		0.4		116		0	116.1
2-Mar-77	13:30			20	4.2			192		169	6		4		122		0	114.1
1-Apr-77	14:45			30	1.8			235		179	3.2		1.2		150.4		0	140.2
18-May-77	10:15			35	23			109		74	39.2		32.4		71.8		0	73.4
20-Jun-77	9:55			35	1.4			113		101	3.6		0.8		85		0	81.3
14-Jul-77	14:20			50	14.6			101		83	22.4		15.2		71.4		0	72.1
15-Aug-77	11:50			30	1.6			79.8		57	5.2		2.4		61.8		0	66.3
23-Aug-77	11:50																	
13-Sep-77	10:55			25	1.1			102		80	2		L0.4		78.3		0	76.7
12-Oct-77	12:45			40	3.35			124		93	5.6		2.4		93.5		0	88.7
7-Nov-77	13:50			35	2.2			123		101	2.4		0.8		90.2		0	90.4
7-Dec-77	13:30			25	3.35			121		93	4		2.4		87		0	83.8
8-Feb-78	10:00			30	3.2			151		129	4		0.8		100.4		0	103.3
20-Mar-78	11:36			30	2.95			134		121	2		L0.4		93.6		0	92.9
6-Apr-78	15:25			25	3.4			127		109	2		L0.4		86.8		0	87.9
3-May-78	11:45			140	279			84			370		326		53.6		0	58.5

Note: L = Less than, G = Greater than

Appendix Water quality data, Ells River 1972 - 1996. (continued)

Date	Time	Total CaCO3 Hardness 10604 mg/L	Total CaCO3 Hardness 10605 mg/L	Specific Cond. Field 100924 µS/cm	TDS calc'd 205 mg/L	TDS 207 mg/L	Specific Cond. Lab. 2041 µS/cm	Calcium, diss. 20101 mg/L	Calcium, diss. 20103 mg/L	Calcium, diss. 20107 mg/L	Calcium, diss. 20111 mg/L	Fluoride, diss. 9105 mg/L	Fluoride, diss. 9107 mg/L	Magnesium, diss. fltrd. 12102 mg/L	Magnesium, diss. fltrd. 12105 mg/L	Magnesium, diss. fltrd. 12111 mg/L
ELLS RIVER NEAR THE MOUTH - AB07DA0750																
31-Jul-72	12:00						214	25.4				0.1				
22-Aug-72	12:00		98				245	27						7		
25-Sep-72	12:00		98				275	29						5		
28-Sep-72	12:00		72				150	24						2		
5-Oct-72	12:00		128				335	40				L0.05		6		
17-Jun-73	18:20						197	28						12		
14-Aug-73	16:15				97		150	16				0.06		6		
19-Aug-74	13:15	94			126		180					0.16		6		
2-Jul-75	13:30	76			114		194					L0.05		6		
7-Feb-89	12:00															
14-Feb-89	12:15			285												
14-Feb-89	12:20															
7-Mar-89	12:00															
9-Mar-89	10:45		107	232	149		277			29			0.14		8.3	
9-Mar-89	10:50															
14-Mar-90	12:00															
15-Mar-90	9:00		105	225	129	207	244			29			0.12		8	
7-Mar-91	11:00		224	466	285	362	495			60			0.22		18	
7-Mar-91	11:00															
7-Mar-91	11:05															
26-Feb-92	10:30		100	237	127	180	236			27			0.11		8	
26-Feb-92	10:30															
26-Feb-92	10:35															
27-Feb-92	12:00															
10-Mar-93	12:00															
11-Mar-93	9:00		103	220	132	172	237			28			0.11		8	
11-Mar-93	9:00															
11-Mar-93	9:05															
10-Mar-94	11:30		127	315	178	234	320			35			0.15		9	
10-Mar-94	11:30															
10-Mar-94	11:35															
10-Mar-94	12:00															
10-Mar-95	10:45		130	350	198	256	374			36			0.15		10	
10-Mar-95	10:45															
8-Mar-96	10:50		129	216							35.9	0.2				9.6
8-Mar-96	10:50															
ELLS RIVER NEAR THE MOUTH - AB07DA1240																
11-Feb-76	15:26	88		228	116.12		202		23.9			0.05		6.9		
13-May-76	10:46	78		190	97.73		169		21			0.09		6.2		
5-Jun-78	9:10			45			115		17.5			0.05		5.2		
13-Jul-78	10:20			73.5			132		18			0.11		5.3		
15-Aug-78	8:50			66.5			162		22.1				0.14	6.7		
7-Sep-78	9:40			81			193		28				0.05	9.8		
17-Oct-78	9:10			79			125		18.5				0.07	6.3		
20-Nov-78	9:20						190		24				0.1	8		
18-Dec-78	10:00						180		25				L0.05	7.5		
3-Jan-79	8:50						192		24.8				0.05	7.4		
5-Feb-79	11:15						200		23				0.07	7.6		
5-Feb-79	11:45															
20-Mar-79	9:15						200		22				1	6.7		
17-Apr-79	9:30						250		25.5				0.09	17.7		

Appendix Water quality data, Ells River 1972 - 1996. (continued)

Date	Time	Total CaCO3 Hardness 10604 mg/L	Total CaCO3 Hardness 10605 mg/L	Specific Cond. Field 100924 µS/cm	TDS calc'd 205 mg/L	TDS 207 mg/L	Specific Cond. Lab. 2041 µS/cm	Calcium, diss. 20101 mg/L	Calcium, diss. 20103 mg/L	Calcium, diss. 20107 mg/L	Calcium, diss. 20111 mg/L	Fluoride, diss. 9105 mg/L	Fluoride, diss. 9107 mg/L	Magnesium, diss. fltrd. 12102 mg/L	Magnesium, diss. fltrd. 12105 mg/L	Magnesium, diss. fltrd. 12111 mg/L
ELLS RIVER NEAR THE MOUTH - AB07DA1250																
12-Aug-76	12:10						192		22			0.14		7.5		
UPPER ELLS RIVER - AB07DA1280																
8-Oct-76	9:35						129		17.5			0.1		5		
9-Nov-76	9:50						123		16.5			0.08		5		
4-Jan-77	14:15						152		18			0.08		5.2		
7-Feb-77	14:10						150		18.5			0.1		5.8		
1-Mar-77	12:10						151		19.5			0.13		5.8		
1-Mar-77	15:50															
5-May-77	12:00						108		13			0.07		3.7		
31-May-77	14:55						113		13.5			0.09		4.3		
24-Jun-77	14:45						120		14.5			0.08		4.5		
26-Jul-77	13:00						96		14.5			0.14		4.5		
23-Aug-77	11:50						115		14.5			0.07		4.3		
21-Sep-77	12:45						110		16			0.09		4.7		
18-Oct-77	11:30						106		14			0.1		4.8		
3-Dec-77	12:00						124		16			0.12		5.2		
11-Jan-78	13:30			5300			139		16.5			0.09		5.7		
8-Feb-78	14:00			140			141		18			0.1		6		
28-Feb-78	12:20						146		19			0.1		6		
10-Apr-78	16:35						108		14.7			0.1		4.7		
2-May-78	14:30						70		10			0.08		3.5		
27-Jun-78	12:10						100		13.8			0.05		4.5		
25-Jul-78	12:00			58			108		12.8			0.13		4.6		
22-Aug-78	10:45			43			105		17.3				0.11	5.5		
19-Sep-78	15:30			70			135		14				L0.05	4.2		
19-Oct-78	13:25			430			90		14.6				0.07	4.5		
1-Dec-78	15:10			450			115		15.5				L0.05	5.3		
14-Dec-78	10:10			80			400		50				L0.05	16		
12-Jan-79	13:45						130		15				L0.05	5.3		
9-Feb-79	8:30						125		17				0.08	4.9		
LOWER ELLS RIVER - AB07DA1400																
9-Oct-76	10:00						240		27			0.08		8.2		
10-Nov-76	9:05						240		29			0.12		9.2		
4-Jan-77	14:35						250		29.5			0.11		8.3		
9-Feb-77	14:50						290		31.5			0.09		9.1		
2-Mar-77	13:30						300		31.5			0.13		8.6		
1-Apr-77	14:45						370		38			0.16		11		
18-May-77	10:15			150			173		19.5			0.08		6		
20-Jun-77	9:55						194		21			0.09		7		
14-Jul-77	14:20			169			165		19			0.12		6		
15-Aug-77	11:50			146			133		17.5			0.09		5.5		
23-Aug-77	11:50															
13-Sep-77	10:55			177			153		20.5			0.12		6.2		
12-Oct-77	12:45			188			190		24			0.1		7		
7-Nov-77	13:50			210			186		23			0.15		8		
7-Dec-77	13:30						183		22.5			0.13		6.7		
8-Feb-78	10:00			130			228		28.5			0.15		7.8		
20-Mar-78	11:36			110			204		25			0.15		7.4		
6-Apr-78	15:25			99			193		23			0.13		7.4		
3-May-78	11:45			128			110		15.2			0.08		5		

Note: L = Less than, G = Greater than

Appendix Water quality data, Ells River 1972 - 1996. (continued)

Date	Time	Sodium, diss. fltrd. 11101 mg/L	Sodium, diss. fltrd. 11102 mg/L	Sodium, diss. fltrd. 11103 mg/L	Sodium, diss. fltrd. 11111 mg/L	Potassium, diss. 19101 mg/L	Potassium, diss. 19102 mg/L	Potassium, diss. 19103 mg/L	Potassium, diss. 19111 mg/L	Bicar-bonate 6202 mg/L	Carbonate, diss. 6302 mg/L	Chloride, diss. 17203 mg/L	Chloride, diss. 17206 mg/L	Sulphate, diss. 16302 mg/L	Sulphate, diss. 16303 mg/L	Sulphate, diss. 16306 mg/L	Sulphide, diss. 16101 mg/L
ELLS RIVER NEAR THE MOUTH - AB07DA0750																	
31-Jul-72	12:00			11								2.1			16.8		
22-Aug-72	12:00	16				1.7						6		32			
25-Sep-72	12:00	20				1.4						4		34			
28-Sep-72	12:00	3				1.2						L1		15			
5-Oct-72	12:00	28				2.3						6		52			
17-Jun-73	18:20	12				1.1						4		80			
14-Aug-73	16:15		11				1.1					8		15			
19-Aug-74	13:15		6				0.8					2		37			
2-Jul-75	13:30		11				3					5				19	
7-Feb-89	12:00																
14-Feb-89	12:15			18									2.9			27	
14-Feb-89	12:20																
7-Mar-89	12:00																
9-Mar-89	10:45			15				1.5		139			3			22	
9-Mar-89	10:50																
14-Mar-90	12:00																
15-Mar-90	9:00			9				1.1		126			1			18	
7-Mar-91	11:00			22				3.5		249			3.3			53	
7-Mar-91	11:00																
7-Mar-91	11:05																
26-Feb-92	10:30			12				1.3		117			1.7			18	
26-Feb-92	10:30																
26-Feb-92	10:35																
27-Feb-92	12:00																
10-Mar-93	12:00																
11-Mar-93	9:00			11				1.4		119			1.4			24	
11-Mar-93	9:00																
11-Mar-93	9:05																
10-Mar-94	11:30			21				1.6		165			3.5			24	
10-Mar-94	11:30																
10-Mar-94	11:35																
10-Mar-94	12:00																
10-Mar-95	10:45			25				1.7		191			4			26	
10-Mar-95	10:45																
8-Mar-96	10:50				13.7				1.7	151	L0.5		2.3			17.6	L0.005
8-Mar-96	10:50																
ELLS RIVER NEAR THE MOUTH - AB07DA1240																	
11-Feb-76	15:26			10.5				1					4.2			15	
13-May-76	10:46			8.4				1.3								18	
5-Jun-78	9:10			5.8				0.95				1.1				8.6	L0.01
13-Jul-78	10:20			5.5				0.7				1				7.4	L0.01
15-Aug-78	8:50			9.5				0.9				1.5				14.2	L0.01
7-Sep-78	9:40			13				1				1.5				20.8	L0.01
17-Oct-78	9:10			6.5				0.55				1				17	L0.01
20-Nov-78	9:20			10.5				1.1				2				20.5	L0.01
18-Dec-78	10:00			6.5				0.7				1.4				13.8	L0.01
3-Jan-79	8:50			8.4				0.8				2				17	L0.01
5-Feb-79	11:15			12				1.3				2.2				21	L0.01
5-Feb-79	11:45																
20-Mar-79	9:15			11				1				1.8				18	L0.01
17-Apr-79	9:30			12.3				1				25.5				23.8	L0.01

Appendix Water quality data, Ells River 1972 - 1996. (continued)

Date	Time	Sodium, diss. fltrd. 11101 mg/L	Sodium, diss. fltrd. 11102 mg/L	Sodium, diss. fltrd. 11103 mg/L	Sodium, diss. fltrd. 11111 mg/L	Potassium, diss. 19101 mg/L	Potassium, diss. 19102 mg/L	Potassium, diss. 19103 mg/L	Potassium, diss. 19111 mg/L	Bicar-bonate 6202 mg/L	Carbonate, diss. 6302 mg/L	Chloride, diss. 17203 mg/L	Chloride, diss. 17206 mg/L	Sulphate, diss. 16302 mg/L	Sulphate, diss. 16303 mg/L	Sulphate, diss. 16306 mg/L	Sulphide, diss. 16101 mg/L
ELLS RIVER NEAR THE MOUTH - AB07DA1250																	
12-Aug-76	12:10		10.8				1.2					5.3				22.4	L0.05
UPPER ELLS RIVER - AB07DA1260																	
8-Oct-76	9:35		3.5				0.4					0.4				8.1	L0.05
9-Nov-76	9:50		3.5				0.8					0.5				5.5	L0.05
4-Jan-77	14:15		8				1.2					0.5				7.1	L0.05
7-Feb-77	14:10		3.7				1.1					2.1				6.8	
1-Mar-77	12:10		4				1.3					0.7				6.8	
1-Mar-77	15:50																
5-May-77	12:00		2.7				0.9					0.3				6.8	
31-May-77	14:55		2.9				0.6					0.3				5.2	
24-Jun-77	14:45		2.9				1					0.5				4.2	
26-Jul-77	13:00			2.4				0.7				0.4				5.6	
23-Aug-77	11:50			2.9				1.1				0.3				6.8	
21-Sep-77	12:45			3.4				0.96				0.3				5.3	
18-Oct-77	11:30			3.1				0.84				0.5				7	
3-Dec-77	12:00			3.6				0.9				0.6				8.1	
11-Jan-78	13:30			4				1				0.7				7	
8-Feb-78	14:00			4				1				0.5				7.8	
28-Feb-78	12:20			3.9				1				0.4				7.8	
10-Apr-78	16:35			3.7				0.9				1				9.5	
2-May-78	14:30			2.3				0.9				0.7				3.5	
27-Jun-78	12:10			2.4				0.6				1.3				5.3	
25-Jul-78	12:00			2.5				0.07				1.1				5.9	L0.002
22-Aug-78	10:45			2.8				0.5				0.6				5.7	L0.01
19-Sep-78	15:30			2.9				0.7				1.8				8.4	L0.01
19-Oct-78	13:25			1.4				0.5				0.7				6.1	L0.01
1-Dec-78	15:10			2.9				1.05				0.7				4.9	L0.01
14-Dec-78	10:10			15				1				5.4				3.2	L0.01
12-Jan-79	13:45			3.2				0.7				0.8				6.2	L0.01
9-Feb-79	8:30			3.9				0.9				1				9.3	L0.01
LOWER ELLS RIVER - AB07DA1400																	
9-Oct-76	10:00		16.2				0.8					3.7				21.3	L0.05
10-Nov-76	9:05		14				1.4					2.4				16.8	L0.05
4-Jan-77	14:35		12.5				1.5					2.2				16.6	L0.05
9-Feb-77	14:50		18				1.5					2.9				22.9	
2-Mar-77	13:30						1.6					3.4				23	
1-Apr-77	14:45		26				2.2					5.4				30.2	
18-May-77	10:15		9				1.3					1.7				16	
20-Jun-77	9:55		10.5				1.5					2				13.6	
14-Jul-77	14:20		7.5				1.1					1.1				13.5	
15-Aug-77	11:50			5				0.9				0.6				9.7	
23-Aug-77	11:50																
13-Sep-77	10:55			8				1.06				1				9.3	
12-Oct-77	12:45			11.5				1.25				1.4				10.5	
7-Nov-77	13:50			10.5				1.3				2				14.8	
7-Dec-77	13:30			8.4				1.1				1.8				12.5	
8-Feb-78	10:00			13				1.3				2				17.3	
20-Mar-78	11:36			12.5				1				2.1				16	
6-Apr-78	15:25			13				1.2				2.6				20.5	
3-May-78	11:45			8.2				2				1.7				15.4	

Note: L = Less than, G = Greater than

Appendix Water quality data, Ells River 1972 - 1996. (continued)

Date	Time	Sulphide, diss. 101484 mg/L	TP 15421 mg/L	TP 15406 mg/L	TP 15420 mg/L	TP 15422 mg/L	TDP 15114 mg/L	TDP 15105 mg/L	Organic Phosphate, diss. 15363 mg/L	Ortho-Phosphate, diss. 15256 mg/L	Phosph ate, tot. 15407 mg/L	Nitrate & Nitrite, diss. 7105 mg/L	Nitrate & Nitrite, diss. 7106 mg/L	Nitrate & Nitrite, diss. 7110 mg/L	Nitrate & Nitrite, diss. 7111 mg/L	Nitrate, diss. 7306 mg/L	Nitrite, diss. 7205 mg/L	Nitrite, diss. 7206 mg/L	Nitrogen, diss. 7651 mg/L
ELLS RIVER NEAR THE MOUTH - AB07DA0750																			
31-Jul-72	12:00								0.0071				0.04						
22-Aug-72	12:00			0.1								L0.1							
25-Sep-72	12:00			0.2								L0.1							
28-Sep-72	12:00			0.2								L0.1							
5-Oct-72	12:00			0.1								L0.1							
17-Jun-73	18:20			0.9								L0.1							
14-Aug-73	16:15			0.7								L0.1							
19-Aug-74	13:15										L0.1	L0.1						L0.1	
2-Jul-75	13:30										1.4	L0.1						L0.1	
7-Feb-89	12:00																		
14-Feb-89	12:15					0.0529	0.03							0.375					
14-Feb-89	12:20																		
7-Mar-89	12:00																		
9-Mar-89	10:45					0.0449	0.025					0.4		0.38			0.002		
9-Mar-89	10:50																		
14-Mar-90	12:00																		
15-Mar-90	9:00					0.0296	0.015												
7-Mar-91	11:00	L0.001	0.028					0.018							0.25		0.002		
7-Mar-91	11:00														0.604		0.004		
7-Mar-91	11:05																		
26-Feb-92	10:30	L0.001	0.027					0.014							0.285			L0.001	
26-Feb-92	10:30																		
26-Feb-92	10:35																		
27-Feb-92	12:00																		
10-Mar-93	12:00																		
11-Mar-93	9:00	L0.001	0.021					0.01							0.193			0.001	
11-Mar-93	9:00																		
11-Mar-93	9:05																		
10-Mar-94	11:30	L0.001	0.03					0.016							0.534			0.003	
10-Mar-94	11:30																		
10-Mar-94	11:35																		
10-Mar-94	12:00																		
10-Mar-95	10:45	L0.001	0.02					0.01							0.408			0.002	
10-Mar-95	10:45																		
8-Mar-96	10:50	L0.001				0.0249	0.014							0.481					
8-Mar-96	10:50																		
ELLS RIVER NEAR THE MOUTH - AB07DA1240																			
11-Feb-76	15:26				0.02										0.17				0.56
13-May-76	10:46				0.17										L0.01				0.4
5-Jun-78	9:10			0.046						0.01				0.013		0.01		0.003	
13-Jul-78	10:20			0.016						0.007				0.01		0.007		0.003	
15-Aug-78	8:50			0.025						0.005				L0.003					
7-Sep-78	9:40			0.064						0.011				L0.003					
17-Oct-78	9:10			0.066						0.014				L0.003					
20-Nov-78	9:20			0.039						0.034				0.04					
18-Dec-78	10:00			0.031						0.008				0.061					
3-Jan-79	8:50			0.17						0.01				0.106		0.1		0.006	
5-Feb-79	11:15			0.037						0.012				0.28		0.27		0.01	
5-Feb-79	11:45																		
20-Mar-79	9:15			0.03						0.009				0.23		0.22		0.01	
17-Apr-79	9:30			0.035						0.02				0.18		0.172		0.008	

Appendix Water quality data, Ells River 1972 - 1996. (continued)

Date	Time	Sulphide, diss. 101484 mg/L	TP 15421 mg/L	TP 15406 mg/L	TP 15420 mg/L	TP 15422 mg/L	TDP 15114 mg/L	TDP 15105 mg/L	Organic Phosphate, diss. 15363 mg/L	Ortho-Phosphate, diss. 15256 mg/L	Phosphate, tot. 15407 mg/L	Nitrate & Nitrite, diss. 7105 mg/L	Nitrate & Nitrite, diss. 7106 mg/L	Nitrate & Nitrite, diss. 7110 mg/L	Nitrate & Nitrite, diss. 7111 mg/L	Nitrate, diss. 7306 mg/L	Nitrite, diss. 7205 mg/L	Nitrite, diss. 7206 mg/L	Nitrogen, diss. 7651 mg/L
ELLS RIVER NEAR THE MOUTH - AB07DA 250																			
12-Aug-76	12:10			0.14						0.04				0.01					
UPPER ELLS RIVER - AB07DA1250																			
8-Oct-76	9:35			0.07						0.01				L0.01					
9-Nov-76	9:50			0.06						0.02				0.18					
4-Jan-77	14:15			0.09						0.02				0.37					
7-Feb-77	14:10			0.05						0.04				0.09					
1-Mar-77	12:10			0.06						0.02				0.17					
1-Mar-77	15:50																		
5-May-77	12:00			0.06						0.01				L0.01					
31-May-77	14:55			0.06						0.02				L0.01					
24-Jun-77	14:45			0.05						0.02				0.01					
26-Jul-77	13:00			0.035						0.013				L0.003					
23-Aug-77	11:50			0.036						0.003				0.003				L0.003	
21-Sep-77	12:45			0.037						0.005				0.013				0.011	
18-Oct-77	11:30			0.037						0.006				0.056					
3-Dec-77	12:00			0.031						0.011				0.195					
11-Jan-78	13:30			0.035						0.011				0.14					
8-Feb-78	14:00			0.033						0.018				0.135		0.132		0.003	
28-Feb-78	12:20			0.031						0.013				0.137		0.134		0.003	
10-Apr-78	16:35			0.026						0.013				0.102					
2-May-78	14:30			0.03						0.011				0.069		0.066		0.003	
27-Jun-78	12:10			0.035						0.01				0.011		0.008		0.003	
25-Jul-78	12:00			0.031						L0.003				L0.003					
22-Aug-78	10:45			0.032						0.009				0.003					
19-Sep-78	15:30			0.038						0.015				0.015					
19-Oct-78	13:25			0.036						0.022				0.003					
1-Dec-78	15:10			0.15						0.021				0.33					
14-Dec-78	10:10			0.03						0.005				0.046					
12-Jan-79	13:45			0.037						0.018				0.074		0.066		0.008	
9-Feb-79	8:30			0.049						0.01				0.12		0.11		0.01	
LOWER ELLS RIVER - AB07DA1400																			
9-Oct-76	10:00			0.34						0.02				L0.01					
10-Nov-76	9:05			0.07						0.01				0.13					
4-Jan-77	14:35			0.05						0.01				0.37					
9-Feb-77	14:50			0.05						0.03				0.12					
2-Mar-77	13:30			0.09						0.06				0.28					
1-Apr-77	14:45			0.03						0.01				0.43					
18-May-77	10:15			0.05						L0.01				L0.01					
20-Jun-77	9:55			0.028						L0.003				0.017					
14-Jul-77	14:20			0.055						0.017				0.003					
15-Aug-77	11:50			0.022						0.003				0.003				L0.003	
23-Aug-77	11:50																		
13-Sep-77	10:55			0.015						L0.003				0.009				0.009	
12-Oct-77	12:45			0.033						0.006				0.004				L0.003	
7-Nov-77	13:50			0.009						L0.003				0.028					
7-Dec-77	13:30			0.02						L0.003				0.125					
8-Feb-78	10:00			0.027						0.003				0.23				0.005	
20-Mar-78	11:36			0.016						L0.003				0.278		0.275		0.003	
6-Apr-78	15:25			0.016						0.007				0.26					
3-May-78	11:45			0.049						0.022				0.066		0.062		0.004	

Note: L = Less than, G = Greater than

Appendix Water quality data, Ells River 1972 - 1996. (continued)

Date	Time	Nitrogen, tot. part. 7906 mg/L	TKN 7001 mg/L	TKN 7013 mg/L	TKN 7015 mg/L	TKN 7021 mg/L	Nitrogen, tot. (TKN + NO2/NO3) calc'd. mg/L	Ammonia, diss. 7551 mg/L	Ammonia, diss. 7555 mg/L	Ammonia, diss. 7562 mg/L	Ammonia, tot. 7505 mg/L	Aluminum, tot. 100844 mg/L	Aluminun, extr. 13302 mg/L	Aluminun, extr. 13306 mg/L	Antimony, extr. 51302 mg/L	Arsenic, diss. 33101 mg/L	Arsenic, diss. 33104 mg/L	Arsenic, extr. 33301 mg/L
ELLS RIVER NEAR THE MOUTH - AB07DA0750																		
31-Jul-72	12:00		0.85				0.89											
22-Aug-72	12:00							0.4										
25-Sep-72	12:00							0.4										
28-Sep-72	12:00							0.5										
5-Oct-72	12:00							0.6										
17-Jun-73	18:20							2.1										
14-Aug-73	16:15							L0.2										
19-Aug-74	13:15							0.3										
2-Jul-75	13:30							L0.2										
7-Feb-89	12:00																	
14-Feb-89	12:15	0.03			0.56		0.935				0.02							
14-Feb-89	12:20																	
7-Mar-89	12:00																	
9-Mar-89	10:45	0.03			0.84		1.24				0.01			0.024				
9-Mar-89	10:50																	
14-Mar-90	12:00																	
15-Mar-90	9:00	0.03				0.52	0.77				0.03			0.018				
7-Mar-91	11:00	0.04				0.97	1.574				0.09			0.016				
7-Mar-91	11:00																	
7-Mar-91	11:05																	
26-Feb-92	10:30					0.44	0.725				L0.01			0.02				
26-Feb-92	10:30																	
26-Feb-92	10:35																	
27-Feb-92	12:00																	
10-Mar-93	12:00																	
11-Mar-93	9:00	0.04				0.54	0.733			0.009				0.02				
11-Mar-93	9:00																	
11-Mar-93	9:05																	
10-Mar-94	11:30	0.17				0.56	1.094			0.016				L0.005				
10-Mar-94	11:30																	
10-Mar-94	11:35																	
10-Mar-94	12:00																	
10-Mar-95	10:45	0.05				0.55	0.958			0.025				L0.005				
10-Mar-95	10:45																	
8-Mar-96	10:50				0.6		1.081				0.03	0.04						
8-Mar-96	10:50																	
ELLS RIVER NEAR THE MOUTH - AB07DA1240																		
11-Feb-76	15:26												0.056		L0.01			L0.0005
13-May-76	10:46												0.24			0.0006		
5-Jun-78	9:10				0.72		0.733		0.04				0.31				0.0023	
13-Jul-78	10:20				1.78		1.79		0.03				0.07				L0.0002	
15-Aug-78	8:50				0.74		0.74		0.052				0.06				0.0003	
7-Sep-78	9:40				1.12		1.12		0.043				0.19				0.0005	
17-Oct-78	9:10				0.69		0.69						0.23				0.0032	
20-Nov-78	9:20				0.8		0.84		0.043				0.05				0.0011	
18-Dec-78	10:00				0.64		0.701		0.004				0.14				L0.0002	
3-Jan-79	8:50						0.106						0.06					
5-Feb-79	11:15				0.94		1.22		0.03				0.13				0.0003	
5-Feb-79	11:45																	
20-Mar-79	9:15				1.02		1.25		0.007				0.04				0.0005	
17-Apr-79	9:30				1.48		1.66		0.015				0.06				0.0007	

Appendix Water quality data, Ells River 1972 - 1996. (continued)

Date	Time	Nitrogen, tot. part. 7906 mg/L	TKN 7001 mg/L	TKN 7013 mg/L	TKN 7015 mg/L	TKN 7021 mg/L	Nitrogen, tot. (TKN + NO2/NO3) calc'd. mg/L	Ammonia, diss. 7551 mg/L	Ammonia, diss. 7555 mg/L	Ammonia, diss. 7562 mg/L	Ammonia, tot. 7505 mg/L	Aluminum, tot. 100844 mg/L	Aluminun, extr. 13302 mg/L	Aluminun, extr. 13306 mg/L	Antimony, extr. 51302 mg/L	Arsenic, diss. 33101 mg/L	Arsenic, diss. 33104 mg/L	Arsenic, extr. 33301 mg/L
ELLS RIVER NEAR THE MOUTH - AB07DA1280																		
12-Aug-76	12:10			2.7			2.71		0.07				0.51					
UPPER ELLS RIVER - AB07DA1260																		
8-Oct-76	9:35			0.58			0.58		0.08				0.07					
9-Nov-76	9:50			0.1			0.28		0.09				0.03				L0.001	
4-Jan-77	14:15			0.81			1.18		0.13				0.05				0.005	
7-Feb-77	14:10			0.95			1.04		0.02				L0.01				L0.001	
1-Mar-77	12:10			0.6			0.77		0.07				0.02				L0.0005	
1-Mar-77	15:50																	
5-May-77	12:00			0.55			0.55		0.01				0.16				0.0016	
31-May-77	14:55			0.73			0.73		0.04				0.17				L0.0005	
24-Jun-77	14:45			0.92			0.93		0.01				0.04				L0.0002	
26-Jul-77	13:00			0.98			0.98		0.05				0.25				0.0004	
23-Aug-77	11:50			1.02			1.023		0.11				L0.01				L0.0002	
21-Sep-77	12:45			0.88			0.893		0.02				0.04				L0.0002	
18-Oct-77	11:30				0.78		0.836		L0.04				0.06				0.0004	
3-Dec-77	12:00				0.85		1.045		0.06				0.03				L0.0002	
11-Jan-78	13:30				0.6		0.74		0.05				0.04				0.0008	
8-Feb-78	14:00				7.85		7.985		0.06				0.04				L0.0002	
28-Feb-78	12:20				0.7		0.837		0.07				0.03				0.0004	
10-Apr-78	16:35				0.57		0.672		0.03				0.1				L0.0002	
2-May-78	14:30				0.82		0.869		0.06				0.29				0.0007	
27-Jun-78	12:10				1.09		1.101		0.035				0.08				0.0003	
25-Jul-78	12:00				0.8		0.8		0.02				0.04				0.0008	
22-Aug-78	10:45				0.74		0.743		0.031				0.03				0.0009	
19-Sep-78	15:30				0.11		0.125						0.31				0.0012	
19-Oct-78	13:25				0.67		0.673						0.07				0.0007	
1-Dec-78	15:10				2.1		2.43		0.082				0.45				0.002	
14-Dec-78	10:10				0.6		0.646		0.033				0.03				L0.0002	
12-Jan-79	13:45				0.66		0.734		0.028				0.05				0.0012	
9-Feb-79	8:30				0.9		1.02		0.039				0.03					
LOWER ELLS RIVER - AB07DA1400																		
9-Oct-76	10:00			0.63			0.63		0.09				0.33					L0.001
10-Nov-76	9:05			0.2			0.33		0.07				0.095				L0.001	
4-Jan-77	14:35			1.11			1.48		0.14				0.1				0.009	
9-Feb-77	14:50			0.63			0.75		L0.01				0.09				L0.001	
2-Mar-77	13:30			0.68			0.96		0.12				0.07				L0.0005	
1-Apr-77	14:45			0.79			1.22		0.05				0.07				0.0026	
18-May-77	10:15			0.73			0.73		L0.01				0.88				0.0011	
20-Jun-77	9:55			0.81			0.827		0.01				0.14				0.0005	
14-Jul-77	14:20			0.97			0.973		L0.01				0.17				0.0002	
15-Aug-77	11:50			0.98			0.983		0.05				0.09				L0.0002	
23-Aug-77	11:50																	
13-Sep-77	10:55			1.1			1.109		0.02				0.07				0.0003	
12-Oct-77	12:45				0.88		0.884		0.02				0.16				0.0004	
7-Nov-77	13:50				0.82		0.848		L0.01				0.02				0.0006	
7-Dec-77	13:30				0.65		0.775		0.05				0.06				0.0006	
6-Feb-78	10:00				1.05		1.28		0.07				0.03				L0.0002	
20-Mar-78	11:36				0.71		0.988		0.01				0.16				L0.0002	
6-Apr-78	15:25				0.77		1.03		0.02				0.06				L0.0002	
3-May-78	11:45				2.17		2.236		0.11				14.7				0.0055	

Note: L = Less than, G = Greater than

Appendix Water quality data, Ells River 1972 - 1996. (continued)

Date	Time	Arsenic, tot. 33003 mg/L	Arsenic, tot. 33005 mg/L	Arsenic, tot. 33011 mg/L	Barium, extr. 56301 mg/L	Barium, tot. 56009 mg/L	Barium, tot. 100840 µg/L	Beryllium, diss. 4101 mg/L	Beryllium, diss. 4103 mg/L	Beryllium, extr. 4301 mg/L	Beryllium, tot. 4009 mg/L	Boron, diss. 5105 mg/L	Boron, diss. 5106 mg/L	Boron, extr. 5210 mg/L	Cadmium, diss. 48102 mg/L	Cadmium, extr. 48302 mg/L	Cadmium, extr. 48303 mg/L	Cadmium, tot. 48003 mg/L
ELLS RIVER NEAR THE MOUTH - AB07DA0750																		
31-Jul-72	12:00																	
22-Aug-72	12:00															L0.001		
25-Sep-72	12:00																	
28-Sep-72	12:00																	
5-Oct-72	12:00	L0.001																
17-Jun-73	18:20																	0.004
14-Aug-73	16:15																	L0.001
19-Aug-74	13:15																	L0.001
2-Jul-75	13:30																	L0.001
7-Feb-89	12:00																L0.001	
14-Feb-89	12:15																	
14-Feb-89	12:20																	
7-Mar-89	12:00																	
9-Mar-89	10:45			0.0009		0.04			L0.001									
9-Mar-89	10:50																	
14-Mar-90	12:00																	
15-Mar-90	9:00			0.0006		0.036			L0.001									
7-Mar-91	11:00			0.0006		0.094			L0.001									
7-Mar-91	11:00																	
7-Mar-91	11:05																	
26-Feb-92	10:30			0.0004		0.037			L0.001									
26-Feb-92	10:30																	
26-Feb-92	10:35																	
27-Feb-92	12:00																	
10-Mar-93	12:00																	
11-Mar-93	9:00			0.0004		0.046			L0.001									
11-Mar-93	9:00																	
11-Mar-93	9:05																	
10-Mar-94	11:30			0.0004		0.051					L0.001							
10-Mar-94	11:30																	
10-Mar-94	11:35																	
10-Mar-94	12:00																	
10-Mar-95	10:45			0.0003		0.054			L0.001									
10-Mar-95	10:45																	
8-Mar-96	10:50		L0.0002				50											
8-Mar-96	10:50																	
ELLS RIVER NEAR THE MOUTH - AB07DA1240																		
11-Feb-76	15:26				L0.05			L0.005		L0.005				0.1		L0.001		
13-May-76	10:46				L0.05					L0.005		0.1			0.001	0.001		
5-Jun-78	9:10																	
13-Jul-78	10:20																	
15-Aug-78	8:50																	
7-Sep-78	9:40																	
17-Oct-78	9:10																	
20-Nov-78	9:20																	
18-Dec-78	10:00																	
3-Jan-79	8:50																	
5-Feb-79	11:15																	
5-Feb-79	11:45																	
20-Mar-79	9:15																	
17-Apr-79	9:30																	

Appendix Water quality data, Ells River 1972 - 1996. (continued)

Date	Time	Arsenic, tot. 33003 mg/L	Arsenic, tot. 33005 mg/L	Arsenic, tot. 33011 mg/L	Barium, extr. 56301 mg/L	Barium, tot. 56009 mg/L	Barium, tot. 100840 µg/L	Beryllium, diss. 4101 mg/L	Beryllium, diss. 4103 mg/L	Beryllium, extr. 4301 mg/L	Beryllium, tot. 4009 mg/L	Boron, diss. 5105 mg/L	Boron, diss. 5106 mg/L	Boron, extr. 5210 mg/L	Cadmium, diss. 48102 mg/L	Cadmium, extr. 48302 mg/L	Cadmium, extr. 48303 mg/L	Cadmium, tot. 48003 mg/L
ELLS RIVER NEAR THE MOUTH - AB07DA1250																		
12-Aug-76	12:10		0.005									0.2				L0.001		
UPPER ELLS RIVER - AB07DA1260																		
8-Oct-76	9:35		L0.001									0.07				L0.001		
9-Nov-76	9:50											0.05				L0.001		
4-Jan-77	14:15											0.02				L0.001		
7-Feb-77	14:10											0.19				L0.001		
1-Mar-77	12:10											0.18				L0.001		
1-Mar-77	15:50																	
5-May-77	12:00											0.07				L0.001		
31-May-77	14:55											0.09				0.002		
24-Jun-77	14:45											0.03				L0.001		
26-Jul-77	13:00											0.03				0.002		
23-Aug-77	11:50											0.06				L0.001		
21-Sep-77	12:45											0.13				L0.001		
18-Oct-77	11:30											0.05				L0.001		
3-Dec-77	12:00															L0.001		
11-Jan-78	13:30												0.01			L0.001		
6-Feb-78	14:00												0.05			L0.001		
28-Feb-78	12:20												0.06			L0.001		
10-Apr-78	16:35												0.07			L0.001		
2-May-78	14:30												0.07			L0.001		
27-Jun-78	12:10																	
25-Jul-78	12:00																	
22-Aug-78	10:45																	
19-Sep-78	15:30																	
19-Oct-78	13:25																	
1-Dec-78	15:10																	
14-Dec-78	10:10																	
12-Jan-79	13:45																	
9-Feb-79	8:30																	
LOWER ELLS RIVER - AB07DA1400																		
9-Oct-76	10:00											0.15				L0.001		
10-Nov-76	9:05											0.07				L0.001		
4-Jan-77	14:35											0.13				L0.001		
9-Feb-77	14:50											0.29				L0.001		
2-Mar-77	13:30											0.3				L0.001		
1-Apr-77	14:45											0.29				L0.001		
18-May-77	10:15											0.09				0.003		
20-Jun-77	9:55											0.09				L0.001		
14-Jul-77	14:20											0.12				L0.001		
15-Aug-77	11:50											0.05				L0.001		
23-Aug-77	11:50																	
13-Sep-77	10:55											0.21				L0.001		
12-Oct-77	12:45											0.12				L0.001		
7-Nov-77	13:50											0.07				L0.001		
7-Dec-77	13:30											0.06				L0.001		
8-Feb-78	10:00												0.08			L0.001		
20-Mar-78	11:36												0.16			L0.001		
6-Apr-78	15:25												0.13			L0.001		
3-May-78	11:45												0.18			L0.001		

Note: L = Less than, G = Greater than

Appendix Water quality data, Ells River 1972 - 1996. (continued)

Date	Time	Cadmium, tot. 48009 mg/L	Cadmium, tot. 100852 µg/L	Chromium, Hexavalent 24101 mg/L	Chromium, tot. 24004 mg/L	Chromium, tot. 24009 mg/L	Chromium, tot. 100858 mg/L	Chromium, extr. 24302 mg/L	Chromium, extr. 24305 mg/L	Cobalt, diss. 27102 mg/L	Cobalt, extr. 27302 mg/L	Cobalt, extr. 27303 mg/L	Cobalt, tot. 27003 mg/L	Cobalt, tot. 27004 mg/L	Cobalt, tot. 27009 mg/L	Copper, diss. 29105 mg/L	Copper, extr. 29302 mg/L
ELLS RIVER NEAR THE MOUTH - AB07DA0750																	
31-Jul-72	12:00							L0.006			0.008						
22-Aug-72	12:00																
25-Sep-72	12:00																
28-Sep-72	12:00																
5-Oct-72	12:00				0.003									0.004			
17-Jun-73	18:20				0.038									L0.001			
14-Aug-73	16:15				L0.001								L0.001				
19-Aug-74	13:15				0.017								L0.001				
2-Jul-75	13:30								L0.001			0.007					0.011
7-Feb-89	12:00																
14-Feb-89	12:15																
14-Feb-89	12:20																
7-Mar-89	12:00																
9-Mar-89	10:45	L0.001				0.002									L0.001		
9-Mar-89	10:50																
14-Mar-90	12:00																
15-Mar-90	9:00	L0.001				0.001									L0.001		
7-Mar-91	11:00	0.002				0.003									L0.001		
7-Mar-91	11:00																
7-Mar-91	11:05																
26-Feb-92	10:30	L0.001				0.001									L0.001		
26-Feb-92	10:30																
26-Feb-92	10:35																
27-Feb-92	12:00																
10-Mar-93	12:00																
11-Mar-93	9:00	L0.001				0.003									L0.001		
11-Mar-93	9:00																
11-Mar-93	9:05																
10-Mar-94	11:30	L0.001				L0.001									L0.001		
10-Mar-94	11:30																
10-Mar-94	11:35																
10-Mar-94	12:00																
10-Mar-95	10:45	L0.001				L0.001									L0.001		
10-Mar-95	10:45																
8-Mar-96	10:50		0.7				0.003										
8-Mar-96	10:50																
ELLS RIVER NEAR THE MOUTH - AB07DA1240																	
11-Feb-76	15:26							L0.015		L0.002	L0.002						
13-May-76	10:46							L0.015			0.003					0.002	
5-Jun-78	9:10			0.007													
13-Jul-78	10:20			0.003													
15-Aug-78	8:50			L0.003													
7-Sep-78	9:40			0.006													
17-Oct-78	9:10			0.005													
20-Nov-78	9:20			0.004													
18-Dec-78	10:00			0.004													
3-Jan-79	8:50			0.005													
5-Feb-79	11:15			L0.003													
5-Feb-79	11:45																
20-Mar-79	9:15			L0.003													
17-Apr-79	9:30			L0.003													

Appendix Water quality data, Ells River 1972 - 1996. (continued)

Date	Time	Cadmium, tot. 48009 mg/L	Cadmium, tot. 100852 µg/L	Chromium, Hexavalent 24101 mg/L	Chromium, tot. 24004 mg/L	Chromium, tot. 24009 mg/L	Chromium, tot. 100858 mg/L	Chromium, extr. 24302 mg/L	Chromium, extr. 24305 mg/L	Cobalt, diss. 27102 mg/L	Cobalt, extr. 27302 mg/L	Cobalt, extr. 27303 mg/L	Cobalt, tot. 27003 mg/L	Cobalt, tot. 27004 mg/L	Cobalt, tot. 27009 mg/L	Copper, diss. 29105 mg/L	Copper, extr. 29302 mg/L
ELLS RIVER NEAR THE MOUTH - AB07DA1250																	
12-Aug-76	12:10			L0.003							L0.002						
UPPER ELLS RIVER - AB07DA1200																	
8-Oct-76	9:35			L0.003							L0.002						
9-Nov-76	9:50			L0.003							L0.002						
4-Jan-77	14:15			L0.003							L0.002						
7-Feb-77	14:10			L0.003							L0.002						
1-Mar-77	12:10			L0.003							L0.002						
1-Mar-77	15:50																
5-May-77	12:00			L0.003							0.002						
31-May-77	14:55			L0.003							L0.002						
24-Jun-77	14:45			L0.003							L0.002						
26-Jul-77	13:00			L0.003							L0.002						
23-Aug-77	11:50			L0.003							L0.002						
21-Sep-77	12:45			L0.003							L0.002						
18-Oct-77	11:30			L0.003							L0.002						
3-Dec-77	12:00			L0.003							L0.002						
11-Jan-78	13:30			L0.003							L0.002						
8-Feb-78	14:00			L0.003							L0.002						
28-Feb-78	12:20			L0.003							L0.002						
10-Apr-78	16:35			L0.003							L0.001						
2-May-78	14:30			0.005							L0.001						
27-Jun-78	12:10			0.004													
25-Jul-78	12:00			0.003													
22-Aug-78	10:45			0.003													
19-Sep-78	15:30			L0.003													
19-Oct-78	13:25			L0.003													
1-Dec-78	15:10			0.003													
14-Dec-78	10:10			0.003													
12-Jan-79	13:45			0.005													
9-Feb-79	8:30			L0.003													
LOWER ELLS RIVER - AB07DA1400																	
9-Oct-76	10:00			L0.003							0.003						
10-Nov-76	9:05			L0.003							L0.002						
4-Jan-77	14:35			L0.003							L0.002						
9-Feb-77	14:50			L0.003							L0.002						
2-Mar-77	13:30			L0.003							L0.002						
1-Apr-77	14:45			0.005							L0.002						
18-May-77	10:15			L0.003							L0.002						
20-Jun-77	9:55			L0.003							L0.002						
14-Jul-77	14:20			L0.003							L0.002						
15-Aug-77	11:50			L0.003							L0.002						
23-Aug-77	11:50																
13-Sep-77	10:55			L0.003							L0.002						
12-Oct-77	12:45			L0.003							L0.002						
7-Nov-77	13:50			L0.003							L0.002						
7-Dec-77	13:30			L0.003							L0.001						
8-Feb-78	10:00			0.003							L0.002						
20-Mar-78	11:36			L0.003							L0.002						
6-Apr-78	15:25			L0.003							L0.001						
3-May-78	11:45			0.017							0.004						

Note: L = Less than, G = Greater than

Appendix Water quality data, Ells River 1972 - 1996. (continued)

Date	Time	Copper, extr. 29305 mg/L	Copper, extr. 29306 mg/L	Copper, tot. 29003 mg/L	Copper, tot. 29009 mg/L	Copper, tot. 100847 µg/L	Cyanide 6601 mg/L	Iron, diss. 26101 mg/L	Iron, extr. 26302 mg/L	Iron, extr. 26304 mg/L	Iron, extr. 26307 mg/L	Iron, tot. 26002 mg/L	Iron, tot. 26009 mg/L	Iron, tot. 100776 mg/L	Lead, diss. 82103 mg/L	Lead, extr. 82302 mg/L	Lead, extr. 82304 mg/L	Lead, tot. 82004 mg/L
ELLS RIVER NEAR THE MOUTH - AB07DA0780																		
31-Jul-72	12:00	0.023									0.2					L0.004		
22-Aug-72	12:00											0.3						
25-Sep-72	12:00											0.1						
28-Sep-72	12:00											0.1						
5-Oct-72	12:00			0.006								0.4						
17-Jun-73	18:20			0.026								12.4						
14-Aug-73	16:15				0.014							L0.1						0.008
19-Aug-74	13:15				0.007				0.6									L0.001
2-Jul-75	13:30						L0.01		1.6								0.01	
7-Feb-89	12:00																	
14-Feb-89	12:15																	
14-Feb-89	12:20																	
7-Mar-89	12:00																	
9-Mar-89	10:45				0.002								0.572			L0.002		
9-Mar-89	10:50																	
14-Mar-90	12:00																	
15-Mar-90	9:00				L0.001								0.46			L0.002		
7-Mar-91	11:00				0.003								0.334			L0.002		
7-Mar-91	11:00																	
7-Mar-91	11:05																	
26-Feb-92	10:30				L0.001								0.438			L0.002		
26-Feb-92	10:30																	
26-Feb-92	10:35																	
27-Feb-92	12:00																	
10-Mar-93	12:00																	
11-Mar-93	9:00				0.001								0.324			0.002		
11-Mar-93	9:00																	
11-Mar-93	9:05																	
10-Mar-94	11:30				0.001								0.543			L0.002		
10-Mar-94	11:30																	
10-Mar-94	11:35																	
10-Mar-94	12:00																	
10-Mar-95	10:45				L0.001								0.291			L0.002		
10-Mar-95	10:45																	
8-Mar-96	10:50					1								0.34				
8-Mar-96	10:50																	
ELLS RIVER NEAR THE MOUTH - AB07DA1240																		
11-Feb-76	15:26	0.007						0.28		0.46						L0.004		
13-May-76	10:46	0.002						0.28		1.36					L0.004	0.005		
5-Jun-78	9:10	L0.001								1.65						L0.002		
13-Jul-78	10:20	L0.001								0.31						L0.002		
15-Aug-78	8:50	L0.001								0.31						L0.002		
7-Sep-78	9:40	L0.001								1.36						L0.002		
17-Oct-78	9:10	L0.001								1.18						0.004		
20-Nov-78	9:20	L0.001								0.84						0.005		
18-Dec-78	10:00	L0.001								0.45						L0.002		
3-Jan-79	8:50	0.003								0.5						L0.002		
5-Feb-79	11:15	0.004								0.9						L0.002		
5-Feb-79	11:45																	
20-Mar-79	9:15	0.005								0.65						L0.002		
17-Apr-79	9:30	0.004								0.43						L0.002		

Appendix Water quality data, Ells River 1972 - 1996. (continued)

Date	Time	Copper, extr. 29305 mg/L	Copper, extr. 29306 mg/L	Copper, tot. 29003 mg/L	Copper, tot. 29009 mg/L	Copper, tot. 100847 µg/L	Cyanide 6601 mg/L	Iron, diss. 26101 mg/L	Iron, extr. 26302 mg/L	Iron, extr. 26304 mg/L	Iron, extr. 26307 mg/L	Iron, tot. 26002 mg/L	Iron, tot. 26009 mg/L	Iron, tot. 100776 mg/L	Lead, diss. 82103 mg/L	Lead, extr. 82302 mg/L	Lead, extr. 82304 mg/L	Lead, tot. 82004 mg/L
ELLS RIVER NEAR THE MOUTH - AB07DA1250																		
12-Aug-76	12:10		0.002				L0.01			0.95						0.004		
UPPER ELLS RIVER - AB07DA1260																		
8-Oct-76	9:35		0.004				L0.01			0.58						L0.002		
9-Nov-76	9:50	0.006					L0.01			0.38						L0.002		
4-Jan-77	14:15	0.021					L0.01			0.36						L0.002		
7-Feb-77	14:10	0.005								0.33						L0.002		
1-Mar-77	12:10	0.001								0.32						L0.002		
1-Mar-77	15:50																	
5-May-77	12:00	0.002								0.41						L0.002		
31-May-77	14:55	0.018								0.36						0.002		
24-Jun-77	14:45	0.001								0.29						L0.002		
26-Jul-77	13:00	0.011								0.28						L0.002		
23-Aug-77	11:50	0.002								0.2						L0.002		
21-Sep-77	12:45	0.002								0.18						L0.002		
18-Oct-77	11:30	0.001								0.21						L0.002		
3-Dec-77	12:00	L0.002								0.19						L0.002		
11-Jan-78	13:30	0.001								0.21						0.007		
8-Feb-78	14:00	0.008					L0.002			0.2						L0.002		
28-Feb-78	12:20	0.006								0.18						0.003		
10-Apr-78	16:35	L0.001					L0.001			0.19						L0.002		
2-May-78	14:30	L0.001					L0.001			0.53						L0.002		
27-Jun-78	12:10	L0.001								0.31						L0.002		
25-Jul-78	12:00	L0.001								0.21						0.002		
22-Aug-78	10:45	0.003								0.24						L0.002		
19-Sep-78	15:30	L0.001								0.3						0.003		
19-Oct-78	13:25	L0.001								0.3						0.003		
1-Dec-78	15:10	0.001								2.55						L0.002		
14-Dec-78	10:10	0.001								0.25						L0.002		
12-Jan-79	13:45	0.002								0.3						L0.002		
9-Feb-79	8:30	0.002								0.5						L0.002		
LOWER ELLS RIVER - AB07DA1400																		
9-Oct-76	10:00		0.003				L0.01			0.88						0.007		
10-Nov-76	9:05	L0.001					L0.01			0.91						0.004		
4-Jan-77	14:35	0.004					L0.01			0.54						L0.002		
9-Feb-77	14:50	0.008								0.89						L0.002		
2-Mar-77	13:30	0.033								0.48						L0.002		
1-Apr-77	14:45	0.017								0.39						0.012		
18-May-77	10:15	0.016								0.91						0.008		
20-Jun-77	9:55	0.001								0.41						0.002		
14-Jul-77	14:20	0.003								0.97						L0.002		
15-Aug-77	11:50	0.002								0.41						L0.002		
23-Aug-77	11:50																	
13-Sep-77	10:55	0.002								0.36						L0.002		
12-Oct-77	12:45	L0.001								0.63						L0.002		
7-Nov-77	13:50	0.004								0.42						L0.002		
7-Dec-77	13:30	0.002								0.3						0.006		
8-Feb-78	10:00	0.008					L0.002			0.75						L0.002		
20-Mar-78	11:36	0.003					L0.002			0.26						L0.002		
6-Apr-78	15:25	L0.001					L0.001			0.28						L0.002		
3-May-78	11:45	0.005					L0.001			7.5						0.002		

Note: L = Less than, G = Greater than

Appendix Water quality data, Ells River 1972 - 1996. (continued)

Date	Time	Lead, tot. 82005 mg/L	Lead, tot. 100849 mg/L	Manganese, extr. 25301 mg/L	Manganese, extr. 25304 mg/L	Manganese, tot. 25003 mg/L	Manganese, tot. 100856 µg/L	Manganese, tot. 101482 mg/L	Mercury, extr. 80301 µg/L	Mercury, extr. 80311 µg/L	Mercury, tot. 80011 µg/L	Mercury, tot. 80015 mg/L	Molybdenum, extr. 42301 mg/L	Molybdenum, tot. 42009 mg/L	Molybdenum, tot. 100843 µg/L	Nickel, diss. 28102 mg/L	Nickel, extr. 28302 mg/L
ELLS RIVER NEAR THE MOUTH - AB07DA0750																	
31-Jul-72	12:00				0.02				0.0001								0.005
22-Aug-72	12:00																
25-Sep-72	12:00																
28-Sep-72	12:00																
5-Oct-72	12:00	0.022						0.02				0.0035					
17-Jun-73	18:20	0.017						0.75				0.0009					
14-Aug-73	16:15							0.023				L0.0002					
19-Aug-74	13:15							0.047				L0.0001					
2-Jul-75	13:30			0.21								0.001					
7-Feb-89	12:00																
14-Feb-89	12:15																
14-Feb-89	12:20																
7-Mar-89	12:00																
9-Mar-89	10:45					0.015						L0.0001		0.002			
9-Mar-89	10:50																
14-Mar-90	12:00																
15-Mar-90	9:00					0.014						L0.0001		L0.001			
7-Mar-91	11:00					0.025						L0.0001		L0.001			
7-Mar-91	11:00																
7-Mar-91	11:05																
26-Feb-92	10:30					0.008						L0.0001		L0.001			
26-Feb-92	10:30																
26-Feb-92	10:35																
27-Feb-92	12:00																
10-Mar-93	12:00																
11-Mar-93	9:00					0.012						L0.0001		0.001			
11-Mar-93	9:00																
11-Mar-93	9:05																
10-Mar-94	11:30					0.014						L0.0001		L0.001			
10-Mar-94	11:30																
10-Mar-94	11:35																
10-Mar-94	12:00																
10-Mar-95	10:45					0.012					L0.04			L0.001			
10-Mar-95	10:45																
8-Mar-96	10:50		0.0005				8				L0.05				L3		
8-Mar-96	10:50																
ELLS RIVER NEAR THE MOUTH - AB07DA1240																	
11-Feb-76	15:26				0.011					L0.05			L0.1				L0.002
13-May-76	10:46				0.055					L0.05			L0.1			0.005	0.01
5-Jun-78	9:10				0.061							L0.0001					0.001
13-Jul-78	10:20				0.024							L0.0001					L0.001
15-Aug-78	8:50				0.014							L0.0001					0.001
7-Sep-78	9:40				0.069							L0.0001					L0.001
17-Oct-78	9:10				0.034							L0.0001					0.002
20-Nov-78	9:20				0.019							L0.0001					0.003
18-Dec-78	10:00				0.012							L0.0001					0.001
3-Jan-79	8:50				0.011												L0.001
5-Feb-79	11:15				0.022							L0.0001					0.002
5-Feb-79	11:45																
20-Mar-79	9:15				0.011							L0.0001					L0.001
17-Apr-79	9:30				0.01							0.0001					L0.001

Appendix Water quality data, Ells River 1972 - 1996. (continued)

Date	Time	Lead, tot. 82005 mg/L	Lead, tot. 100849 mg/L	Manganese, extr. 25301 mg/L	Manganese, extr. 25304 mg/L	Manganese, tot. 25003 mg/L	Manganese, tot. 100856 µg/L	Manganese, tot. 101482 mg/L	Mercury, extr. 80301 µg/L	Mercury, extr. 80311 µg/L	Mercury, tot. 80011 µg/L	Mercury, tot. 80015 mg/L	Molybdenum, extr. 42301 mg/L	Molybdenum, tot. 42009 mg/L	Molybdenum, tot. 100843 µg/L	Nickel, diss. 28102 mg/L	Nickel, extr. 28302 mg/L
ELLS RIVER NEAR THE MOUTH - AB07DA1250																	
12-Aug-76	12:10				0.12							L0.0002					0.005
UPPER ELLS RIVER - AB07DA1260																	
8-Oct-76	9:35				0.09							L0.0002					L0.002
9-Nov-76	9:50				0.03							L0.0001					L0.002
4-Jan-77	14:15				0.04							L0.0001					L0.002
7-Feb-77	14:10				0.032							L0.0001					L0.002
1-Mar-77	12:10				0.035							L0.0001					L0.002
1-Mar-77	15:50																
5-May-77	12:00				0.058							0.0002					L0.002
31-May-77	14:55				0.063							L0.0001					L0.002
24-Jun-77	14:45				0.036							L0.0001					L0.002
26-Jul-77	13:00				0.027							L0.0001					L0.002
23-Aug-77	11:50				0.016							L0.0001					L0.002
21-Sep-77	12:45				0.013							L0.0001					L0.002
18-Oct-77	11:30				0.014							L0.0001					L0.002
3-Dec-77	12:00				0.019							L0.0001					L0.002
11-Jan-78	13:30				0.019							0.0006					L0.002
8-Feb-78	14:00				0.024							L0.0001					L0.002
28-Feb-78	12:20				0.022							L0.0001					L0.002
10-Apr-78	16:35				0.033							L0.0001					L0.001
2-May-78	14:30				0.091							L0.0001					0.003
27-Jun-78	12:10				0.041							L0.0001					L0.001
25-Jul-78	12:00				0.047							L0.0001					L0.001
22-Aug-78	10:45				0.021							L0.0001					L0.001
19-Sep-78	15:30				0.027							L0.0001					L0.001
19-Oct-78	13:25				0.021							L0.0001					L0.001
1-Dec-78	15:10				0.31							L0.0001					L0.001
14-Dec-78	10:10				0.023							L0.0001					0.002
12-Jan-79	13:45				0.029							L0.0001					L0.001
9-Feb-79	8:30				0.022							L0.0001					L0.001
LOWER ELLS RIVER - AB07DA1400																	
9-Oct-76	10:00				0.029							L0.0002					0.004
10-Nov-76	9:05				0.015							L0.0001					L0.002
4-Jan-77	14:35				0.02							L0.0001					L0.002
9-Feb-77	14:50				0.021							L0.0001					L0.002
2-Mar-77	13:30				0.012							L0.0001					0.007
1-Apr-77	14:45				0.013							0.0003					L0.002
18-May-77	10:15				0.047							L0.0001					L0.002
20-Jun-77	9:55				0.038							L0.0001					L0.002
14-Jul-77	14:20				0.057							L0.0001					L0.002
15-Aug-77	11:50				0.021							L0.0001					L0.002
23-Aug-77	11:50																
13-Sep-77	10:55				0.013							L0.0001					L0.002
12-Oct-77	12:45				0.019							L0.0001					L0.002
7-Nov-77	13:50				0.024							L0.0001					L0.002
7-Dec-77	13:30				0.015							0.0002					L0.002
8-Feb-78	10:00				0.01							L0.0001					L0.002
20-Mar-78	11:36				0.011							L0.0001					L0.002
6-Apr-78	15:25				0.013							L0.0001					L0.001
3-May-78	11:45				0.221							L0.0001					0.009

Note: L = Less than, G = Greater than

Appendix Water quality data, Ells River 1972 - 1996. (continued)

Date	Time	Nickel, extr. 28303 mg/L	Nickel, tot. 28004 mg/L	Nickel, tot. 28009 mg/L	Nickel, tot. 100854 µg/L	Nickel, tot. 101481 mg/L	Selenium, diss. 34102 mg/L	Selenium, extr. 34302 mg/L	Selenium, tot. 34005 mg/L	Selenium, tot. 34011 mg/L	Silica, Reactive 14102 mg/L	Silica, Reactive fltrd. 14107 mg/L	Silver, extr. 47301 mg/L	Silver, extr. 47302 mg/L	Strontium, extr. 38301 mg/L	Titanium, tot. 22009 mg/L
ELLS RIVER NEAR THE MOUTH - AB07DA0750																
31-Jul-72	12:00										0.5					
22-Aug-72	12:00															
25-Sep-72	12:00															
28-Sep-72	12:00															
5-Oct-72	12:00		0.018													
17-Jun-73	18:20		0.044													
14-Aug-73	16:15					0.01										
19-Aug-74	13:15					0.004										
2-Jul-75	13:30	0.021														
7-Feb-89	12:00															
14-Feb-89	12:15															
14-Feb-89	12:20															
7-Mar-89	12:00															
9-Mar-89	10:45			0.004						L0.0001		6.1				
9-Mar-89	10:50															
14-Mar-90	12:00															
15-Mar-90	9:00			0.002						L0.0001		6.2				
7-Mar-91	11:00			0.005						0.0002		16.1				
7-Mar-91	11:00															
7-Mar-91	11:05															
26-Feb-92	10:30			0.003						L0.0001		6.1				
26-Feb-92	10:30															
26-Feb-92	10:35															
27-Feb-92	12:00															
10-Mar-93	12:00															
11-Mar-93	9:00			0.003						0.0001		6.4				
11-Mar-93	9:00															
11-Mar-93	9:05															
10-Mar-94	11:30			0.001						0.0001		7.3				
10-Mar-94	11:30															
10-Mar-94	11:35															
10-Mar-94	12:00															
10-Mar-95	10:45			0.001						L0.0001		4.6				
10-Mar-95	10:45															
8-Mar-96	10:50				18.4				L0.0002							
8-Mar-96	10:50															
ELLS RIVER NEAR THE MOUTH - AB07DA1240																
11-Feb-76	15:26							L0.0005			2.8			L0.004	0.1	
13-May-76	10:46										2				0.11	
5-Jun-78	9:10						0.0002				2.6					
13-Jul-78	10:20						L0.0002				L0.02					
15-Aug-78	8:50						0.0003				0.6					
7-Sep-78	9:40						L0.0002				3.6					
17-Oct-78	9:10						L0.0002				4.4					
20-Nov-78	9:20						0.0002				3					
18-Dec-78	10:00						L0.0002				3					
3-Jan-79	8:50										3					
5-Feb-79	11:15						L0.0002				9					
5-Feb-79	11:45															
20-Mar-79	9:15						L0.0002				3.3					
17-Apr-79	9:30						0.0004				3.7					

Appendix Water quality data, Ells River 1972 - 1996. (continued)

Date	Time	Nickel, extr. 28303 mg/L	Nickel, tot. 28004 mg/L	Nickel, tot. 28009 mg/L	Nickel, tot. 100854 µg/L	Nickel, tot. 101481 mg/L	Selenium, diss. 34102 mg/L	Selenium, extr. 34302 mg/L	Selenium, tot. 34005 mg/L	Selenium, tot. 34011 mg/L	Silica, Reactive 14102 mg/L	Silica, Reactive fltrd. 14107 mg/L	Silver, extr. 47301 mg/L	Silver, extr. 47302 mg/L	Strontium, extr. 38301 mg/L	Titanium, tot. 22009 mg/L
ELLS RIVER NEAR THE MOUTH - AB07DA1250																
12-Aug-76	12:10							L0.002			3		L0.005			
UPPER ELLS RIVER - AB07DA1260																
8-Oct-76	9:35							L0.0005			5.2		L0.005			
9-Nov-76	9:50						0.0009				7.3		L0.005			
4-Jan-77	14:15						L0.0005				9.2		L0.005			
7-Feb-77	14:10						L0.0005				9.9		L0.005			
1-Mar-77	12:10						L0.0005				9.5		L0.005			
1-Mar-77	15:50															
5-May-77	12:00						L0.0005				3.7		L0.001			
31-May-77	14:55						L0.0005				4.7		0.001			
24-Jun-77	14:45						L0.0002				3.4		L0.001			
26-Jul-77	13:00						L0.0002				0.7			0.001		
23-Aug-77	11:50						L0.0002				0.6			L0.001		
21-Sep-77	12:45						L0.0002				0.53			L0.001		
18-Oct-77	11:30						L0.0002				0.37			L0.001		L0.05
3-Dec-77	12:00						L0.0002				1			L0.001		L0.05
11-Jan-78	13:30						L0.0002				2			L0.001		L0.05
8-Feb-78	14:00						0.0005				2.3			L0.001		L0.05
28-Feb-78	12:20						L0.0002				2.5			L0.001		L0.05
10-Apr-78	16:35						L0.0002				2.1			L0.001		L0.01
2-May-78	14:30						L0.0002				2			L0.001		L0.01
27-Jun-78	12:10						L0.0002				1.5					
25-Jul-78	12:00						L0.0002				0.5			L0.001		
22-Aug-78	10:45						L0.0002				0.8					
19-Sep-78	15:30						L0.0002				2.4					
19-Oct-78	13:25						L0.0002				1.8					
1-Dec-78	15:10						L0.0002				12.5					
14-Dec-78	10:10						L0.0002				12					
12-Jan-79	13:45						0.0003				2					
9-Feb-79	8:30						L0.0002				2.4					
LOWER ELLS RIVER - AB07DA1400																
9-Oct-76	10:00							0.0009			1.9		0.005			
10-Nov-76	9:05						L0.0005				6.2		L0.005			
4-Jan-77	14:35						L0.0005				9.7		L0.005			
9-Feb-77	14:50						L0.0005				9.9		L0.005			
2-Mar-77	13:30						L0.0005				8.9		L0.005			
1-Apr-77	14:45						L0.0005				9.7		L0.005			
18-May-77	10:15						L0.0005				0.8		0.002			
20-Jun-77	9:55						L0.0002				0.77		L0.001			
14-Jul-77	14:20						L0.0002				2.8		L0.001			
15-Aug-77	11:50						L0.0002				0.5			L0.001		L0.05
23-Aug-77	11:50													L0.001		
13-Sep-77	10:55						L0.0002				0.35			L0.001		L0.05
12-Oct-77	12:45						L0.0002				1.7			L0.001		L0.05
7-Nov-77	13:50						L0.0002				1.2			L0.001		L0.05
7-Dec-77	13:30						L0.0002				2.3			L0.001		L0.05
8-Feb-78	10:00						0.0005				3.4			L0.001		L0.05
20-Mar-78	11:36						L0.0002				3.5			L0.001		L0.01
6-Apr-78	15:25						L0.0002				3.5			L0.001		L0.01
3-May-78	11:45						0.0003				4.4			L0.001		L0.01

Note: L = Less than, G = Greater than

Appendix Water quality data, Ells River 1972 - 1996. (continued)

Date	Time	Vanadium, diss. 23102 mg/L	Vanadium, extr. 23301 mg/L	Vanadium, extr. 23302 mg/L	Vanadium, tot. 23002 mg/L	Vanadium, tot. 23009 mg/L	Vanadium, tot. 100842 µg/L	Zinc, extr. 30304 mg/L	Zinc, extr. 30305 mg/L	Zinc, tot. 30006 mg/L	Zinc, tot. 30009 mg/L	Zinc, tot. 100846 µg/L	TOC 6001 mg/L	TOC 6005 mg/L	DOC 6101 mg/L	POC 6904 mg/L	Carbon, particulate 6905 mg/L
ELLS RIVER NEAR THE MOUTH - AB07DA0750																	
31-Jul-72	12:00								L0.001								
22-Aug-72	12:00																
25-Sep-72	12:00																
28-Sep-72	12:00																
5-Oct-72	12:00									0.012							
17-Jun-73	18:20									0.065							
14-Aug-73	16:15									0.01							
19-Aug-74	13:15									L0.01							
2-Jul-75	13:30																
7-Feb-89	12:00																
14-Feb-89	12:15																
14-Feb-89	12:20																0.31
7-Mar-89	12:00																
9-Mar-89	10:45					0.002					0.01						0.35
9-Mar-89	10:50																
14-Mar-90	12:00																
15-Mar-90	9:00					L0.002					0.002						0.32
7-Mar-91	11:00					0.002					0.003						0.21
7-Mar-91	11:00																
7-Mar-91	11:05																
26-Feb-92	10:30					L0.002					0.002			13			
26-Feb-92	10:30																
26-Feb-92	10:35																
27-Feb-92	12:00																
10-Mar-93	12:00																
11-Mar-93	9:00					L0.002					0.002						0.21
11-Mar-93	9:00																
11-Mar-93	9:05																
10-Mar-94	11:30					L0.002					0.002						0.55
10-Mar-94	11:30																
10-Mar-94	11:35																
10-Mar-94	12:00																
10-Mar-95	10:45					L0.002					0.002						0.41
10-Mar-95	10:45																
8-Mar-96	10:50						L2					15		16		L0.2	
8-Mar-96	10:50																
ELLS RIVER NEAR THE MOUTH - AB07DA1240																	
11-Feb-76	15:26			L0.001					0.005				15		15		
13-May-76	10:46	L0.001		0.001					L0.001				18		16		
5-Jun-78	9:10				L0.001				0.002				40.5		39		
13-Jul-78	10:20				L0.001				L0.001				14		14		
15-Aug-78	8:50				L0.001				0.001				12		11.5		
7-Sep-78	9:40				L0.001				0.003				22		20.5		
17-Oct-78	9:10				L0.001				0.028				21.5		19		
20-Nov-78	9:20				L0.001				0.005				20.5		20.5		
18-Dec-78	10:00				L0.001				0.013				16		14.5		
3-Jan-79	8:50				L0.001				0.002				15.5		15		
5-Feb-79	11:15				0.002				0.004				15		14		
5-Feb-79	11:45																
20-Mar-79	9:15				L0.001				0.026				12.5		12		
17-Apr-79	9:30				L0.001				L0.001				21		19		

Appendix Water quality data, Ells River 1972 - 1996. (continued)

Date	Time	Vanadium, diss. 23102 mg/L	Vanadium, extr. 23301 mg/L	Vanadium, extr. 23302 mg/L	Vanadium, tot. 23002 mg/L	Vanadium, tot. 23009 mg/L	Vanadium, tot. 100842 µg/L	Zinc, extr. 30304 mg/L	Zinc, extr. 30305 mg/L	Zinc, tot. 30006 mg/L	Zinc, tot. 30009 mg/L	Zinc, tot. 100846 µg/L	TOC 6001 mg/L	TOC 6005 mg/L	DOC 6101 mg/L	POC 6904 mg/L	Carbon, particulate 6905 mg/L
ELLS RIVER NEAR THE MOUTH - AB07DA1250																	
12-Aug-76	12:10		L0.001					0.004					20				
UPPER ELLS RIVER - AB07DA1260																	
8-Oct-76	9:35		L0.001					0.006					15		14		
9-Nov-76	9:50				L0.001				0.006				12		8		
4-Jan-77	14:15				L0.001				0.006				17		17		
7-Feb-77	14:10				L0.001				0.004				8		8		
1-Mar-77	12:10				L0.001				0.088				10		10		
1-Mar-77	15:50																
5-May-77	12:00				L0.001				0.005				14		14		
31-May-77	14:55				L0.001				0.015				7		7		
24-Jun-77	14:45				L0.001				0.002				15		12		
26-Jul-77	13:00				L0.001				0.011				12.5		11.5		
23-Aug-77	11:50				L0.001				0.012				13.5		10		
21-Sep-77	12:45				L0.001				0.014				11		11		
18-Oct-77	11:30				L0.001				0.018				12.5		12		
3-Dec-77	12:00				L0.001				0.018				12		10		
11-Jan-78	13:30				L0.001				0.017				13.5		13.5		
8-Feb-78	14:00				L0.001				0.014				9		9		
28-Feb-78	12:20				L0.001				0.007				9.5		9.5		
10-Apr-78	16:35				L0.001				0.002				12.5		12		
2-May-78	14:30				L0.001				0.003				25		24.5		
27-Jun-78	12:10				L0.001				L0.001				18		18		
25-Jul-78	12:00				L0.001				0.023				10.5		10		
22-Aug-78	10:45				L0.001				0.002				11		11		
19-Sep-78	15:30				L0.001				0.004				10		10		
19-Oct-78	13:25				L0.001				0.001				15.5		15		
1-Dec-78	15:10				L0.001				0.007				19.5		16		
14-Dec-78	10:10				L0.001				0.002				17		15.5		
12-Jan-79	13:45				L0.001				0.019				15		15		
9-Feb-79	8:30				L0.001				0.005				15		14		
LOWER ELLS RIVER - AB07DA1400																	
9-Oct-76	10:00		L0.001					0.007					18.5		17		
10-Nov-76	9:05				0.003				0.003				20		18		
4-Jan-77	14:35				L0.001				0.004				18		16		
9-Feb-77	14:50				L0.001				0.011				16		15		
2-Mar-77	13:30				L0.001				0.054				11.5		11		
1-Apr-77	14:45				L0.001				0.011				11		11		
18-May-77	10:15				0.002				0.016				18		18		
20-Jun-77	9:55				L0.001				0.016				7.5		7.5		
14-Jul-77	14:20				L0.001				0.018				21.5		15		
15-Aug-77	11:50				L0.001				0.008				13.5		12		
23-Aug-77	11:50																
13-Sep-77	10:55				L0.001				0.009				11		7.5		
12-Oct-77	12:45				L0.001				0.015				18		17.5		
7-Nov-77	13:50				L0.001				0.009				10		8		
7-Dec-77	13:30				L0.001				0.01				13		10.5		
8-Feb-78	10:00				L0.001				0.009				11.5		11.5		
20-Mar-78	11:36				L0.001				0.011				7.5		7.5		
6-Apr-78	15:25				L0.001				0.001				8		8		
3-May-78	11:45				0.005				0.02				41.5		32		

Note: L = Less than, G = Greater than

Appendix Water quality data, Ells River 1972 - 1996. (continued)

Date	Time	DOC 6104 mg/L	DOC 6107 mg/L	TIC 6051 mg/L	DIC 6151 mg/L	DIC 6154 mg/L	Tannin and Lignin 6551 mg/L	Phenolic Material 6531 mg/L	Phenolic Material 6532 mg/L	Phenolic Material 6537 mg/L	N-Alkanes, C-10 to C-26 6500 µg/L	Aromatic Hydro-carbons 6510 µg/L	Oil and Grease 6521 mg/L	Fulvic Acids, diss. 6588 mg/L	Adsorbable Organic Halides 101485 mg/L	Fulvic acid, Extractable 102645 mg/L	Humic Acid, Extractable 102646 mg/L	Odour Threshhold 2001 TON
ELLS RIVER NEAR THE MOUTH - AB07DA0760																		
31-Jul-72	12:00						0.32	L0.004					66.1					
22-Aug-72	12:00																	
25-Sep-72	12:00																	
28-Sep-72	12:00																	
5-Oct-72	12:00						0.9	0.003					2					4
17-Jun-73	18:20						2.9	0.005					1.8					8
14-Aug-73	16:15						1.8	0.011					1.7					4
19-Aug-74	13:15						1		L0.001				2.3					1
2-Jul-75	13:30						2.7		L0.001				4					2
7-Feb-89	12:00																	
14-Feb-89	12:15		15				0.9			0.007								
14-Feb-89	12:20																	
7-Mar-89	12:00																	
9-Mar-89	10:45		15.5				0.89			0.007								
9-Mar-89	10:50																	
14-Mar-90	12:00																	
15-Mar-90	9:00		14.7				1.16			0.005								
7-Mar-91	11:00		26.6				1.12			0.009								2
7-Mar-91	11:00														0.059			
7-Mar-91	11:05																	
26-Feb-92	10:30	12.8	12.8				0.65			0.005								1
26-Feb-92	10:30														0.004			
26-Feb-92	10:35																	
27-Feb-92	12:00																	
10-Mar-93	12:00																	
11-Mar-93	9:00		15.5			22	0.79			0.006								1
11-Mar-93	9:00														0.007			
11-Mar-93	9:05																	
10-Mar-94	11:30		14			32	0.69			0.004								8
10-Mar-94	11:30														0.015			
10-Mar-94	11:35																	
10-Mar-94	12:00																	
10-Mar-95	10:45		14.3			36.9	0.75			0.006								
10-Mar-95	10:45														0.007			
8-Mar-96	10:50	15.9					0.7			L0.001								
8-Mar-96	10:50														0.006			
ELLS RIVER NEAR THE MOUTH - AB07DA1240																		
11-Feb-76	15:26			20	20				0.008		L1	L1				16	L1	
13-May-76	10:46			15	15				0.006		L1	L1		2		16	2	
5-Jun-78	9:10			12.5			1.3		0.002				0.9			14	L1	2
13-Jul-78	10:20			13.5			0.6		0.015				L0.1			8	L1	2
15-Aug-78	8:50			18			0.5		0.001				L0.1			8	L1	2
7-Sep-78	9:40			20.5			1.4		0.003				0.5			20	L1	2
17-Oct-78	9:10			13.5			1		L0.001				0.8			18	L1	2
20-Nov-78	9:20			19.5			1.1		0.001				1.3			19	L1	2
18-Dec-78	10:00			16			0.7		L0.001				L0.1			6	L1	2
3-Jan-79	8:50			21			0.5		0.001							11	L1	4
5-Feb-79	11:15			20			0.4		0.001				0.9			7	L1	2
5-Feb-79	11:45																	
20-Mar-79	9:15			18.5			0.6		L0.001				0.5			7	1	2
17-Apr-79	9:30			21.5			0.9		0.002				1.6			7	L1	2

Appendix Water quality data, Ells River 1972 - 1996. (continued)

Date	Time	DOC 6104 mg/L	DOC 6107 mg/L	TIC 6051 mg/L	DIC 6151 mg/L	DIC 6154 mg/L	Tannin and Lignin 6551 mg/L	Phenolic Material 6531 mg/L	Phenolic Material 6532 mg/L	Phenolic Material 6537 mg/L	N-Alkanes, C-10 to C-26 6500 µg/L	Aromatic Hydro-carbons 6510 µg/L	Oil and Grease 6521 mg/L	Fulvic Acids, diss. 6588 mg/L	Adsorbable Organic Halides 101485 mg/L	Fulvic acid, Extractable 102645 mg/L	Humic Acid, Extractable 102646 mg/L	Odour Threshhold 2001 TON
ELLS RIVER NEAR THE MOUTH - AB07DA1250																		
12-Aug-76	12:10			22			0.8		0.015				L0.1				2.5	32
UPPER ELLS RIVER - AB07DA1250																		
8-Oct-76	9:35			11			0.85		L0.001				L0.1				L2.5	8
9-Nov-76	9:50			11			0.3		0.02				L0.1				L1	2
4-Jan-77	14:15			14			1.1		0.008				L0.1				L1	2
7-Feb-77	14:10			9			0.75		L0.001				L0.1				L1	2
1-Mar-77	12:10			11			0.5		L0.001				L0.1				L1	2
1-Mar-77	15:50																	
5-May-77	12:00			9			0.6		L0.001				L0.1				L1	2
31-May-77	14:55			11.5			0.9		L0.001				0.3				L1	4
24-Jun-77	14:45			9			1.85		L0.001				0.4				L1	2
26-Jul-77	13:00			10			0.7		L0.001				0.5				L1	2
23-Aug-77	11:50			14			0.5						L0.1				L1	4
21-Sep-77	12:45			10			0.7										L1	2
18-Oct-77	11:30			11			0.5										L1	4
3-Dec-77	12:00			16			0.4										L1	2
11-Jan-78	13:30			13.5			0.5										L1	2
8-Feb-78	14:00			13			0.5										L1	2
28-Feb-78	12:20			17			0.6										L1	2
10-Apr-78	16:35			13			0.5										L1	2
2-May-78	14:30			9.5			1										L1	2
27-Jun-78	12:10			11.5			0.5		L0.001				0.9			9	1	2
25-Jul-78	12:00			16.5			0.6		L0.001				L0.1			11	L1	2
22-Aug-78	10:45			10			0.5		L0.001				0.8			7	L1	2
19-Sep-78	15:30			11			1		0.001				1			12	L1	2
19-Oct-78	13:25			10.5			0.6		L0.001				0.5			7	L1	2
1-Dec-78	15:10			11			0.7		L0.001				1.6			10	L1	2
14-Dec-78	10:10			49			1		0.002				0.6			19	1	2
12-Jan-79	13:45			13.5			0.5		L0.001				0.8			10	L1	2
9-Feb-79	8:30			14			0.5											2
LOWER ELLS RIVER - AB07DA1400																		
9-Oct-76	10:00			24			0.5		L0.001				8.2				2	2
10-Nov-76	9:05			18			0.5		0.024				L0.1				L1	2
4-Jan-77	14:35			23			1.2		L0.001				L0.1				L1	2
9-Feb-77	14:50			20			0.75		0.007				L0.1				L1	2
2-Mar-77	13:30			21.5			0.45		L0.001				L0.1				L1	2
1-Apr-77	14:45			25			0.5		L0.001				L0.1				L1	2
18-May-77	10:15			13			0.9		L0.001				0.5				L1	4
20-Jun-77	9:55			7.5			0.8		L0.001				0.5				L1	8
14-Jul-77	14:20			14			1.1		0.001				0.4				L1	2
15-Aug-77	11:50			14.5			0.6		L0.001				0.7				L1	2
23-Aug-77	11:50																	
13-Sep-77	10:55			13			0.4		L0.001				0.1				L1	2
12-Oct-77	12:45			17			0.7		L0.001				0.5				L1	2
7-Nov-77	13:50			21.5			0.5		L0.001				1.1				L1	4
7-Dec-77	13:30			23.5			0.5		L0.001				0.6				L1	2
8-Feb-78	10:00			18			0.5										1	2
20-Mar-78	11:36			21.5			0.5										L1	1
6-Apr-78	15:25			20			0.4										L1	2
3-May-78	11:45			9			1.9										2	2

Note: L = Less than, G = Greater than

Appendix Water quality data, Ells River 1972 - 1996. (continued)

Date	Time	Bacterial Density, Std. Plate Count 36900 No./mL	Coliforms, tot. 36001 No./100 mL	Coliforms, tot. 36002 No./100 mL	Faecal Coliforms 36011 No./100 mL	Faecal Coliforms 36012 No./100 mL	Chlorophyll-a 6711 mg/L
ELLS RIVER NEAR THE MOUTH - AB07DA0750							
31-Jul-72	12:00						
22-Aug-72	12:00						
25-Sep-72	12:00						
28-Sep-72	12:00						
5-Oct-72	12:00						
17-Jun-73	18:20						
14-Aug-73	16:15						
19-Aug-74	13:15						
2-Jul-75	13:30						
7-Feb-89	12:00						
14-Feb-89	12:15						
14-Feb-89	12:20						
7-Mar-89	12:00						
9-Mar-89	10:45						
9-Mar-89	10:50						
14-Mar-90	12:00						
15-Mar-90	9:00						
7-Mar-91	11:00			100		L4	
7-Mar-91	11:00						
7-Mar-91	11:05						
26-Feb-92	10:30			8		4	
26-Feb-92	10:30						
26-Feb-92	10:35						
27-Feb-92	12:00						
10-Mar-93	12:00						
11-Mar-93	9:00						
11-Mar-93	9:00						
11-Mar-93	9:05						
10-Mar-94	11:30						
10-Mar-94	11:30						
10-Mar-94	11:35						
10-Mar-94	12:00						
10-Mar-95	10:45			12		L4	
10-Mar-95	10:45						
8-Mar-96	10:50			9		L4	
8-Mar-96	10:50						
ELLS RIVER NEAR THE MOUTH - AB07DA1240							
11-Feb-76	15:26						
13-May-76	10:46						
5-Jun-78	9:10						
13-Jul-78	10:20	2000	8.1		2		
15-Aug-78	8:50	630	13		7.8		
7-Sep-78	9:40	1200	33		13		
17-Oct-78	9:10	610	23		23		
20-Nov-78	9:20						
18-Dec-78	10:00	260	6.1		0		
3-Jan-79	8:50	250					
5-Feb-79	11:15						
5-Feb-79	11:45	850	4.5		2		
20-Mar-79	9:15	320	2		2		
17-Apr-79	9:30	600	17		11		

Appendix Water quality data, Ells River 1972 - 1996. (continued)

Date	Time	Bacterial Density, Std. Plate Count 36900 No./mL	Coliforms, tot. 36001 No./100 mL	Coliforms, tot. 36002 No./100 mL	Faecal Coliforms 36011 No./100 mL	Faecal Coliforms 36012 No./100 mL	Chlorophyll-a 6711 mg/L
ELLS RIVER NEAR THE MOUTH - AB07DA1250							
12-Aug-76	12:10						L0.001
UPPER ELLS RIVER - AB07DA1260							
8-Oct-76	9:35	5000	4		0		0.002
9-Nov-76	9:50	140	17		0		L0.001
4-Jan-77	14:15						L0.001
7-Feb-77	14:10						
1-Mar-77	12:10	290	130		79		
1-Mar-77	15:50	60	22		L1.8		
5-May-77	12:00						
31-May-77	14:55						
24-Jun-77	14:45						
26-Jul-77	13:00						
23-Aug-77	11:50						
21-Sep-77	12:45						
18-Oct-77	11:30						
3-Dec-77	12:00						
11-Jan-78	13:30						
8-Feb-78	14:00						
28-Feb-78	12:20						
10-Apr-78	16:35						
2-May-78	14:30						
27-Jun-78	12:10						
25-Jul-78	12:00						
22-Aug-78	10:45	4500	2		0		
19-Sep-78	15:30	10000	13		13		
19-Oct-78	13:25	230	13		0		
1-Dec-78	15:10						
14-Dec-78	10:10	230					
12-Jan-79	13:45	2800	6.8		2		
9-Feb-79	8:30	160	7.8		4.5		
LOWER ELLS RIVER - AB07DA1300							
9-Oct-76	10:00	10000	0		0		L0.001
10-Nov-76	9:05	100	2.2		2.2		L0.001
4-Jan-77	14:35						L0.001
9-Feb-77	14:50	620	2		0		
2-Mar-77	13:30	100	2		L1.8		
1-Apr-77	14:45						
18-May-77	10:15						
20-Jun-77	9:55						
14-Jul-77	14:20	500	4.5		4.5		
15-Aug-77	11:50	1000	4		2		
23-Aug-77	11:50						
13-Sep-77	10:55	3600	13		0		
12-Oct-77	12:45	260	13		13		
7-Nov-77	13:50	3100	4.5		0		
7-Dec-77	13:30						
8-Feb-78	10:00						
20-Mar-78	11:36						
6-Apr-78	15:25						
3-May-78	11:45						

Note: L = Less than, G = Greater than